IMPERIAL BUREAU OF ANIMAL HEALTH

THE

VETERINARY BULLETIN

Vol. 8.] **March, 1938.** [No. 3

DISEASES CAUSED BY BACTERIA AND FUNGI.

KOIVASTIK, T. (1937). Eksperimentaalseid uurimisi boorhappe toimest piima hapnemisele ja mastiidi tekitajaile. [**The Action of Boric Acid on Acidification of Milk and on the Causal Agents of Mastitis**].—*Eeesti loomaarstl. Ring.* **13.** 121-133. 5 tables, 1 graph. [6 refs.] [German summary].

At a temperature lower than 8°C. the multiplication of bacteria is greatly hindered and there is no need to add any preservative to samples taken for bacteriological study. The addition of boric acid to milk samples in concentrations of 0·1–0·2% hinders the development of saprophytic bacteria and delays souring and coagulation. Milk so treated coagulates at 20°–24°C., in $2\frac{1}{2}$–$3\frac{1}{2}$ days. The addition of 0·2% boric acid to milk samples hinders the development of *Streptococcus agalactiae* for 3–4 days.

It is advisable, in warm seasons, to add 0·2% of boric acid to the milk samples intended for bacteriological study. In frozen milk *Str.a.* remains viable for at least 5 days.—E. RIDALA (TARTU).

FREY, O. (1937). Experimentelle und klinische Beobachtungen bei der Infektion des Pferdes mit Streptococcus equi. [*Str. equi* **Infection in Horses**].—*Inaug. Diss., Zurich.* pp. 119. 4 figs. on 4 plates, 12 tables, 17 graphs. [Numerous refs.]

The injection (intraven.) of cell-free filtrates of *Str.e.* culture, or of killed whole culture, into foals produced no harmful results other than a slight local reaction and sometimes slight transient fever. It is claimed that, whilst there is no evidence to show that such a procedure produces an active immunity to subsequent streptococcal infection, the course of such infections is favourably influenced by the therapeutic administration of filtrate or killed whole culture. A record is also given of the therapeutic treatment of 26 cases of purpura haemorrhagica, various methods of treatment being adopted. No conclusions are drawn from these results but the data recorded are of interest.—E. J. PULLINGER.

I. HIERHOLZER, E. (1936). Beiträge zum Vorkommen der Tuberkulose auf erbbiologischer Grundlage in einigen Rinderstämmen. [**Genetical Enquiry into Tuberculosis in Some Strains of Cattle**].—*Inaug. Diss., Hanover.* pp. 51. 9 figs. on 6 plates, 14 tables. [16 refs.]

II. HEUSER, H. (1937). Zur Frage des histologischen Nachweises von Tuberkulose in makroskopisch nicht veränderten Organen und Organlymphknoten von Rindern, die im übrigen nur an einem bezw. zwei Organen makroskopische Veränderungen der Tuberkulose aufweisen. [**Histological Diagnosis of Tuberculosis in Macroscopically Normal Organs of Cattle Showing Local Tuberculosis Elsewhere**].—*Inaug. Diss., Hanover.* pp. 20. [Numerous. refs.]

I. H. studied the incidence of TB. in certain families and strains of cattle. These included five pedigree bulls and a study when possible of their family histories, together with tuberculin tests of their progeny; altogether 373 animals were tested and 44·7% yielded positive reactions.

As a comparison H. gives details of tests he carried out on 1,188 animals in the course of his work in the German TB. control campaign. 7·2% gave positive reactions. These animals were ordinary commercial stock and the housing and feeding were not as good as they might have been. Even so the extent of infection was very low as compared with that in the progeny of the five bulls.

He concludes that the high percentage of infection in the progeny of the five bulls was due to hereditary factors, but the evidence for this assumption does not appear to be provided.

II. H. selected 10 cattle (7 cows and 3 bullocks) showing visible tuberculous changes in only one or (at most) two organs, and made a histological examination of material from all other visibly-normal organs, including the lymph nodes. The average age of the animals was 5·7 years. H. found no tuberculous process in any visibly-normal organ. He contends that the method of meat inspection, hitherto in force, is perfectly adequate to protect the health of the nation.—M. BURKE.

ROUSSEL, & CÈBE. (1937). Tuberculose bovine et B.C.G. (Note préliminaire). [**Bovine Tuberculosis and BCG. I**].—*Rev. Méd. vét., Toulouse.* **89.** 20-26. [3 refs.]

Five calves inoculated with BCG vaccine, five calves believed free from disease, and a series of calves inoculated with tuberculous material were kept together for a period of 15 months. All the infected calves died, but none of the in-contacts appeared to become infected. Records of the tuberculin tests are given, and these show that on some occasions contradictory results were obtained within a few days of each other. Both the single and double intradermal and the subcutaneous tests were used.—H. H. HOLMAN.

I. NASTA, M. (1937). Transformation spontanée *in vitro* d'une souche de bacilles tuberculeux de variété R en variété S. [**Spontaneous Transformation *in vitro* of an "R" Type of Tubercle Bacillus into an "S" Type**].—*C. R. Soc. Biol. Paris.* **125.** 83-85.

II. NASTA, M. (1937). Transformation d'une souche de bacilles tuberculeux d'origine humaine (H. Ratti) et d'une souche d'origine bovine (Bov. Cer.) de type R en type S. [**Transformation of a Human and a Bovine Strain of Tubercle Bacillus from "R" to "S" Type**].—*Ibid.* 85-87. [1 ref.]

III. NASTA, M. (1937). Propriétés pathogènes de bacilles tuberculeux (H. Ratti et Bov. Cer.) de variété S. [**Pathogenic Properties of "S" Strains of Tubercle Bacilli**].—*Ibid.* 87-89.

IV. NASTA, M. (1937). Sensibilité à la tuberculine chez le cobaye inoculé avec des bacilles de la variété S des souches " Bov. Cer." et " H. Ratti " tués par la chaleur. [**Sensitivity to Tuberculin of G. Pigs Inoculated with " S " Types of Heat-Killed Bovine and Human Strains of Tubercle Bacilli**].—*Ibid.* 302-303.

V. NASTA, M. (1937). Réaction du cobaye tuberculeux à la réinfection par voie intradermique avec des bacilles de la variété R et S des souches " Bov. Cer." et " H. Ratti ". [**Reaction of the Tuberculous G. Pig to Intradermal Reinfection with " R " and " S " Types of Bovine and Human Strains of Tubercle Bacilli**].—*Ibid.* 304-306. [1 ref.]

I. N. describes the spontaneous transformation, at first gradual, but later complete, of an " R " type of tubercle bacillus (his laboratory strain H. Ratti) into an " S " type by repeated subcultivation on various media. An attempt to repeat these results with the same strain and the same media was unsuccessful.

II. N. transformed two strains of tubercle bacilli (his laboratory strains H. Ratti and Bov. Cer.) from " R " to " S " types by Deny's method. After subcultivation of these transformed " S " types on egg media the " R " characters gradually returned though not completely. This change back to " R " characteristics could not be induced in the case of the spontaneously transformed H. Ratti " S " type referred to in I.

III. " S " types of two strains of tubercle bacilli (H. Ratti and Bov. Cer.) are shown to be more toxic and virulent for g. pigs and rabbits than " R " types.

IV. N. tested in g. pigs the antigenic properties of heat-killed " S " types of H. Ratti and Bov. Cer. tubercle bacilli as compared with the corresponding heat-killed " R " types and living BCG. Tuberculin reactions 15 days later were generally greater in " S " type than in " R " type injected g. pigs, and equalled or surpassed those of BCG treated g. pigs. Similar results were obtained with antigens from the " R " and " S " types of these bacilli killed by formol.

V. N. tested g. pigs infected by the " R " type of the Bóv. Cer. strain of tubercle bacilli 15, 34 and 54 days after inoculation with reinfecting doses of " R " and " S " types of H. Ratti and Bov. Cer. strains of tubercle bacilli and with BCG. Both the " R " types and BCG caused typical Koch reactions and regressive local lesions whereas the two " S " types caused a progressive local reaction but no phenomenon of Koch. These latter results confirm the marked pathogenic properties of " S " types of tubercle bacilli as described in III.—C. V. WATKINS.

DE VINK, L. P. H. J., & TEN THIJE, J. H. (1937). Modifications histologiques, causées chez le cobaye sain et le cobaye tuberculeux par des injections d'extrait acétonique de bacilles de Koch. [**Histological Modifications Produced in Healthy and Tuberculous G. Pigs by Injections of Acetone Extract of Tubercle Bacilli**].—*Ann. Inst. Pasteur.* **58.** 474-480. 4 figs.

The lesions found on autopsy in five g. pigs which were infected with *Mycobact. tuberculosis* and then given a series of subcutaneous injections with a substance extracted from *M. tuberculosis* by means of acetone, were compared with the lesions produced in g. pigs infected with a similar dose of the live organism alone. A more diffuse type of TB. was found in the animals that had received the injections of the extract. Six g. pigs that received a series of injections of the extract, but no live organisms did not react to tuberculin tests, nor were their organs infective when inoculated into other g. pigs. At autopsy, however, lesions were observed that included the presence of cells resembling epithelioid cells and giant cells, the latter often containing up to ten nuclei scattered throughout the cytoplasm and not arranged around the periphery. These cells were noted both in foci

in the walls of the alveoli of the lungs, and in certain follicles of the spleen, which appeared to be separated from the normal follicles by a band of albumin-like material.—H. H. HOLMAN.

BERG, A. (1936). Immunisierungsversuche an Meerschweinchen mit abgetöteten und abgestorbenen Tuberkelbacillen. [**Immunization of G. Pigs by Killed and Dead Tubercle Bacilli**].—*Beitr. Klin. Tuberk.* **87.** 251-257. 1 table. [16 refs.] [Abst. from abst. in *Zlb. Bakt. I.* (*Ref.*). **122.** 173].

Attempts to immunize g. pigs against TB. by inoculating them three times with dead human type bacilli were unsuccessful.

I. REEVES, R. E., & ANDERSON, R. J. (1937). **The Chemistry of the Lipids of Tubercle Bacilli. XLVIII. The Occurrence of Phthiocerol in the Wax from Various Strains of the Human Tubercle Bacillus.**—*J. biol. Chem.* **119.** 535-541. 1 table. [8 refs.]

II. CASON, J., & ANDERSON, R. J. (1937). **The Chemistry of the Lipids of Tubercle Bacilli. L. The Occurrence of Phthiocerol in the Wax of the Bovine Tubercle Bacillus.**—*Ibid.* 549-551. [7 refs.]

III. REEVES, R. E., & ANDERSON, R. J. (1937). **The Chemistry of the Lipids of Tubercle Bacilli. XLIX. The Colorimetric Determination of Phthicol.** —*Ibid.* 543-547. 2 tables. [8 refs.]

I & II. A dihydric alcohol, phthiocerol, has been isolated from the wax fraction of tubercle bacilli (human type) but not from the avian tubercle bacillus, the leprosy bacillus nor from saprophytic acid-fast bacilli. The authors now report the isolation of this substance from several strains of the human and bovine types of tubercle bacillus. A simple technique for isolating it in a pure crystalline form is described.

III. A simple colorimetric method of identifying reasonably small amounts of phthicerol is reported.—E. J. PULLINGER.

POPPE. (1936). Diphtheriebakterien bei Tieren. [**Diphtheria in Animals**].—*Dtsch. med. Wschr.* **62.** 2127-2129. [Numerous refs.] [Abst. from abst. in *Zlb. Bakt. I.* (*Ref.*). **125.** 502].

Corynebact. diphtheriae is very rarely found in domestic animals, though a few authentic cases have been recorded. On the other hand pseudo-diphtheria bacilli are common in animals and have been mistaken for it in the past. P. emphasises that in the identification of an organism as *C.d.*, toxin production and tests on g. pigs are necessary. There is no evidence that animals are concerned in the epidemiology of human diphtheria.

TOMOV, Z. (1936). V'rhu patogennata i toksigenna rolja na *B. pseudotuberculosis ovis* (Preisz Nocard) i několko nahodki na sžšćija pri kozi u nas'. [*B. pseudotuberculosis ovis* **Infection** (*Corynebacterium ovis* **Infection**) **in Goats in Bulgaria**].—*Vet. Sbir.* **40.** 107-114. [Numerous refs.] [German summary].

T. received from an abattoir in the Sofia region during the autumn of 1935 material consisting of pulmonary and mediastinal lymph nodes of goats, with suppurating abscesses of the size of small nuts. Lesions due to *Corynebacterium ovis* were found in the carcasses of 56 out of 1,562 goats slaughtered and were found to be due to pseudotuberculosis. Among 1,650 sheep only four were found to have similar lesions.

OCHI, Y., & ZAIZEN, Y. (1937). **Studies on** *Corynebacterium pyogenes.* **II. Description of** *Corynebacterium pseudopyogenes N.sp.* **and its Comparison with** *C. pyogenes.*—*J. Jap. Soc. vet. Sci.* **16.** 17-31 of pt. 1. 6 tables. [In Japanese: English summary pp. 8-9 of pt. 2]. [See also *V. B.* **6.** 793].

In a study of strains of *C. pyogenes* isolated from abscesses in cattle and from normal mucous membranes of cattle and other animals, the authors found a diphtheroid resembling *C.p.* in many morphological and cultural characters but differing in being non-haemolytic, less saccharolytic and less proteolytic. O. and Z. consider that these strains have little pathogenic significance as they were found only in normal mucous membranes.—C. A. MCGAUGHEY.

ANON. (1936). Vaccinatie tegen septichaemia epizootica in een gedeelte van de onderafdeeling Makale-Rantepao, afdeeling Loewoe, gewest Celebes en onderhoorigheden, in het tweede halfjaar 1935 (6e halfjaarlijksche vaccinatie). [**Vaccination against Haemorrhagic Septicaemia in Makale-Rantepao, West Celebes, July-December, 1935**].—*Ned.-ind. Bl. Diergeneesk.* **48.** 296-303. 1 table.

The results of the half-yearly prophylactic vaccination against H. S. were again very successful, inasmuch as not a single buffalo contracted the disease within the observation period of six months, whereas several cases occurred among the non-vaccinated animals in the same district.—M. J. J. HOUTHUIS (ROTTERDAM).

I. VAN ES, L., & OLNEY, J. (1936). **The Immunising Value of Commercial Haemorrhagic Septicaemia Aggressins.**—*Res. Bull. Neb. agric. Exp. Sta.* No. 87. pp. 16. 29 tables.

II. SANDERS, D. A. (1937). **Haemorrhagic Septicaemia Investigations. The Significance of Pasteurella Boviseptica Encountered in the Blood of Some Florida Cattle.**—*J. Amer. vet. med. Ass.* **90.** 737-748. [10 refs.]

III. MCKENNEY, F. D., & SHILLINGER, J. E. (1937). **Studies on an Epizootic in Domestic Rabbits caused by Pasteurella Cuniculicida.**—*Ibid.* 755-768. 4 tables. [9 refs.]

I. Regarding GOCHENOUR'S (1924) work as inconclusive, the authors conducted many experiments – some under approximately field conditions – using some hundreds of rabbits and fowls, including controls, to test 13 samples of aggressin prepared by 7 different " concerns ".

They find no reason to believe that the H. S. aggressins of commerce can be depended upon to protect livestock against pasteurella infection. Indeed, some samples seemed to reduce resistance rather than increase it.

II. S. describes seven experiments involving 33 cattle and 22 crows, and concludes that the demonstration of *Pasteurella boviseptica* in material from the bodies of animals suspected to have died from H. S. is not proof that the cause of death was actually H. S.

The experiments include unsuccessful attempts to produce clinical H. S. by ingestion and nasal spray of cultures isolated from carcasses of cattle that had died in the field [cause of death not ascertained], by lowering the animal's natural resistance by plant poisoning, by rail transportation, by attacks of *Anaplasma marginale* and by other ways. Eye instillation set up H. S. in crows. Omphalophlebitis was caused in sucking calves by umbilical injections.

III. The authors record an epizootic in domestic rabbits caused by *Past. lepiseptica.* Forms of the disease recognized were :– (1) an acute septicaemic rapidly fatal form ; (2) a subacute nasal rhinitis form ; (3) a chronic type characterized by subcutaneous abscesses, and (4) an infection of the reproductive organs.

Cultures from all the forms caused infection, but the form produced depended not on the source of the infective material, but on the individual resistance of the animal – a great factor being its physical condition.—E. E. JELBART.

I. REITANO, U. (1937). Recherches sur la vitalité, sur la virulence et sur l'éventuel pouvoir immunisant du B. pestis desséché. [**Vitality, Virulence and Possible Immunizing Power of Dried** *Past. pestis*].—*Boll. Sez. ital. Soc. int. Microbiol.* **9.** 55-59. [In French].

II. REITANO, U. (1937). A propos de la valeur d'un vaccin pesteux vivant, dans les épreuves d'immunisation sur les animaux. [**Tests of a Live** *Past. pestis* **Vaccine on Animals**].—*Ibid.* 60-64. [In French].

I. A strain of known virulence was used and the organism dried rapidly and stored *in vacuo* in small sealed glass tubes. Dried culture grew in broth up to 30 months after storage, the growth at first being slow. When tubes were left open – the contents having been dried – subcultures were obtainable up to the 10th day but not on the 20th day. When suspended in saline and mixed with cultures of non-pathogenic bacteria or talc the dried powder was non-pathogenic for g. pigs or rats. The g. pigs used in these pathogenicity experiments were shown to have obtained no immunity when subsequently tested. Cultures from material dried for 30 months were still pathogenic for g. pigs and rats, but the virulence was reduced.

II. The variable nature of the virulence of different strains of the bacillus is discussed. A strain absolutely innocuous for g. pigs and rats was used, and the immunizing power was found to be poor. Not all living strains, therefore, confer a strong immunity.—F. H. MANLEY.

HIRATO, K. (1936). **Experimental Studies on the Infectious Abortion in Mares. IV. Serological Observations.**—*J. Jap. Soc. vet. Sci.* **15.** 319-347 of pt. 1. 14 tables. [19 refs.] [In Japanese: abst. from English summary pp. 82-84 of pt. 2]. [See also *V. B.* **6.** 312].

In pregnant mares experimentally infected with *Salmonella abortus equi*, agglutinins appeared in the serum 5 days after intravenous inoculation; after infection *per os* they appeared in 7 days, reaching to maximum titre in 10 to 14 days. There was no noticeable rise after abortion and about one month later agglutinins began to decrease, but sometimes persisted for over one year. The titres of the sera of normal mares before inoculation ranged from 1:50 to 1:200 when tested against an O suspension; there was no agglutination against H suspensions. After intravenous or oral administration of live organisms, O agglutinins chiefly were produced; after subcutaneous inoculation, both H and O agglutinins appeared. This also occurred when repeated inoculation with killed suspensions was given, but if these animals were later inoculated with living bacteria, the titre of O agglutinins increased, but not the H titre. Similarly after spontaneous infection and abortion, the titre for O agglutinins increased to a much greater degree than for H agglutinins. In rabbits also it was found that intravenous inoculation led to the production of O agglutinins whereas subcutaneous injection brought about development of H agglutinins; after repeated injections, both types of agglutinins appeared and there was no difference in the results obtained.

When precipitin and complement-fixation tests were carried out, it was found that precipitins disappeared earlier and that complement-fixing antibodies appeared later but disappeared more slowly.—C. A. MCGAUGHEY.

SCHULZE, H. (1935). Die Empfänglichkeit der Ratte für den Erreger der Kückenruhr (Bact. pullorum). [**The Susceptibility of the Rat to** *Salmonella pullorum*]. —*Arch. Geflügelk.* **9.** 185-191. [Abst. from abst. in *Zlb. Bakt. I.* (*Ref.*). **121.** 284].

Rats of various ages were given massive doses of *S.p.* perorally or subcut., but in no case did any illness result. After ingestion of cultures the bacteria were all eliminated from the body within 3 days, and after injection, within a period of 4-13 days. The author, therefore, concludes that rats are of no significance in the epidemiology of pullorum disease.

ČERNOZUBOV, N., FILIPOVIÉ, D., & STAVEL, J. (1937). Zur Salmonellafrage. Serobakteriologische, epidemiologische und klinische Untersuchungen aus den Jahren 1931-1935. [**Salmonella Types Isolated from Man and Animals in Yugoslavia, 1931-35**].—*Zlb. Bakt. I.* (*Orig.*). **138.** 460-483. 7 tables. [15 refs.]

A record is given of 230 cultures of salmonella isolated from 199 human patients during the five years 1931-35. The greater number were isolated from the blood stream and of the types isolated 92 were *S. enteritidis*, 58 were *S. cholerae-suis* var. *kunzendorf* and 48 were *S. paratyphi* B. During the same period 1,719 strains of *S. typhi* were isolated.

In addition, *S. typhi-murium* (5 strains) was isolated from the horse, mouse, g. pig and canary; and *S. paratyphi* B (4 strains) was isolated from the horse and pig [this is unusual, as it is generally assumed that this type is a human pathogen only; confirmation is desirable]. *S. cholerae-suis* var. *kunzendorf* (12 strains) was isolated from one cat and from pigs; *S. enteritidis* from a mouse and from three cows and *S. enteritidis* var. *danysz* from a rat.

Apart from *S. typhi* the only organisms which were isolated from epidemics were *S. paratyphi* A and *S. paratyphi* B. The other salmonellas were from sporadic cases of disease in man or in animals. In a small number of cases only was the clinical picture one of acute gastro-enteritis. Of the 199 human cases there was evidence of a mixed salmonella infection in 15 and in a proportion of these, two different salmonella were actually isolated from the blood stream of a patient.

—R. LOVELL.

EDWARDS, P. R. (1937). **A New Salmonella Type Possessing a Hitherto Undescribed Non-Specific Antigen.**—*J. Hyg., Camb.* **37.** 384-387. 1 table. [8 refs.]

The antigenic formula of *Salmonella anatum* is III X; eh; 1 4 6, but two strains isolated by RETTGER from baby ducklings in 1920 have a distinct somatic antigenic component which is given the number XV. E. proposes to call this organism the Newington type because of its geographical origin.

A strain isolated by BEAUDETTE from a baby chick has now been examined; it possesses the same somatic antigens as the Newington type, but has other flagellar antigens. It is proposed to call this the New Brunswick type, and it has specific flagellar antigens similar to the London type of salmonella; the non-specific antigens cannot be completely reconciled with those in the Kauffmann-White schema and they are tentatively named 1 7 +. This also applies to the Nyborg type of *S. anatum*. A revision of the non-specific antigens is called for. The antigenic formulae of the organisms of the London-Anatum group is as follows :–

London	III X;	lv ; 1 4 6 :
Anatum	III X;	eh ; 1 4 6 :
Anatum var. *muenster* ...	III X;	eh ; 1 4 5 :
Anatum var. *nyborg*... ...	III X;	eh ; 1 7 +:
Newington	III XV;	eh ; 1 4 6 :
New Brunswick	III XV;	lv ; 1 7 +.

The Newington type had hitherto not been described under that name and had received the formulae III XII, for its somatic antigens, but factor XII had previously been used by KAUFFMANN for an antigen present in groups B and D of the salmonella group.—R. LOVELL.

HAUPT, H. (1937). Der Abortusbazillus ist ein obligator Parasit und nicht ubiquitär. [*Br. abortus* **is an Obligatory Parasite**].—*Tierärztl. Rdsch.* **43.** 125-131. [7 refs.]

A discussion of relevant literature indicating that so far as our knowledge goes *Br.a.* is an obligatory parasite and has no existence (apart from survival under favourable conditions) outside the animal host.—E. J. PULLINGER.

ITABASHI, M., & WATANABE, S. (1936). **Studies on Contagious Abortion in Sheep. I. Outbreak of Contagious Abortion among Ewes, and of Malta Fever among Veterinarians and Shepherds at the Rinsi Sheep Farm in Rinsi. (Inner Mongolia).**—*J. Jap. Soc. vet. Sci.* **15.** 286-295 of pt. 1. 6 tables. [7 refs.] [In Japanese : abstract from English summary pp. 76-77 of pt. 2].

The organism causing this outbreak was found by serological and bacteriostatic methods to be *Brucella melitensis*.—P. S. WATTS.

I. MAYER, J. B. (1937). Ueber den Nachweis und die Verbreitungsweise der Tetanusbazillen im menschlichen und tierischen Organismus. Ein Beitrag zur Pathogenese der Tetanusinfektion. [**Pathogenesis of Tetanus Infection in Man and Animals**].—*Zlb. Bakt. I.* (*Orig.*). **139.** 137-151. [Num. refs.]

II. PFÜTZNER, W. (1937). Immunisierungsversuche gegen Tetanus an Maüsen mit Alaunformoltoxoid. [**Immunization against Tetanus with Alum-Formol Toxoid**].—*Z. InfektKr. Haustiere.* **51.** 43-49. [Numerous refs.]

I. A discussion of the pathogenesis of tetanus in which an attempt is made to decide whether infection must always result from the production of toxin at the original site where the bacilli gained entrance, or whether the bacilli can be distributed by the blood stream and lie dormant in places remote from the original site of entry. In the latter case some activating factor would be necessary to stimulate toxin production at some later date. Whilst there is no definite proof available to support the dormancy theory, M. considers it significant that he has been able to demonstrate the presence of living tetanus bacilli in the blood stream and internal organs of animals.

II. A report of the successful use of alum-precipitated formol-toxoid in tests of active immunization of white mice against tetanus.—E. J. PULLINGER.

SCOTT, J. P. (1937). **The Action of Preservatives and Salts on Blackleg Cultures.** —*J. infect. Dis.* **61.** 103-109. 3 tables. [Numerous refs.]

Since preservative agents, particularly phenol and formaldehyde, destroy young cultures of aerobic more rapidly than anaerobic bacteria, they are useful in isolating the latter from mixed cultures. Some, *e.g.*, the lower aldehydes and sodium salicylate increase the potency of aggressin filtrates while others, *e.g.*, potassium alum, precipitate almost the whole of the aggressive substances.

—P. S. WATTS.

OXER, D. T. (1937). **Alum-Vaccine as an Antigen for the Prophylactic Immunization of Sheep against Black Disease.**—*Aust. vet. J.* **13.** 3-15. 11 tables, 1 graph. [15 refs.]

Although for some years satisfactory results have been obtained in the prevention of black disease by two inoculations of 5 c.c. of formolized culture, an attempt was made to produce a more potent vaccine.

A test for determining the antigenic value of *Clostridium oedematiens* toxoid was first developed. This consists of allowing serial dilutions of toxoid to react with standard antiserum, then adding a constant amount of toxin and injecting the mixture into mice. In this way the amount of antitoxin which has combined with the toxoid can be estimated. The antigenic value of toxoid estimated by this method was found to be a true indication of its immunizing properties.

A series of experiments were then carried out to determine the optimum conditions for precipitation of toxoid with potash alum. It was found that the maximum precipitation of toxoid, with the minimum volume of the resultant precipitate, was obtained with a concentration of 2% alum, a pH value of 6·5 to 7·8 and an initial temperature of 37°C. The antitoxic response in g. pigs to formolized whole culture was greater when the same quantity was given in two doses than when it was given as one dose. Half that quantity of vaccine together with 2% alum given as one dose was more effective than the full quantity of vaccine alone given as two doses. Vaccination experiments in sheep showed that alum-precipitated vaccine stimulated an antitoxic response which was not only much greater, but also sustained for a long time at a much higher level than that following either one or two doses of the old formolized culture vaccine.

The injection of sheep with activated spores and culture proved to be unsatisfactory for comparing the immunity produced by different vaccines. However it was possible to conclude that one dose of 2 c.c. of the alum vaccine caused as much resistance to injections as 10 c.c. of the old vaccine given as one or two doses.

—W. I. B. BEVERIDGE.

MIHAILESCU, M., & CIUREA, V. (1936). Sur la fermentation de la salicine par le Vibrion septique et par le B. chauvei. [**Fermentation of Salicin by** *Clostridium septique* **and** *Cl. chauvoei*].—*Arhiva vet.* **28.** 187-191. 2 tables. [15 refs.] [In French].

Eight strains of *Cl. septique* were compared to eight strains of *Cl. chauvoei* with regard to their power of fermenting salicin and the pH of the medium after 48 hours incubation.

The results showed clearly that with the various media used this method of differentiation was open to error.—H. H. HOLMAN.

ROSSI, P., & VIGEL, F. (1936). Le botulisme des bovins. [**Botulism in Cattle**]. —*Rev. gén. Méd. vét.* **45.** 641-670. [Numerous refs.]

An account is given of an outbreak considered to be botulism in a small herd of cattle, following the death of four geese from an unknown cause. Two cows and a heifer became affected, and some days later the two cows died. After the second death botulism was diagnosed and two further cows that were showing symptoms, and the sick heifer, were treated with an intravenous injection of polyvalent serum and made a rapid recovery. Six adults and three heifers received a dose of anatoxin A and B. Three days after the administration of the anatoxin one cow showed symptoms of the disease and was treated successfully with serum. The clinical history of four affected animals is given including the differential leucocyte count which shows in each case a low lymphocytic count and a high

proportion of mononuclear cells. The principle symptoms appeared to be salivation, the presence of food in the mouth, and a difficulty in swallowing, together with the presence of mydriasis.—H. H. HOLMAN.

GUNNISON, J. B., CUMMINGS, J. R., & MEYER, K. F. (1936). **Clostridium Botulinum Type E.**—*Proc. Soc. exp. Biol., N.Y.* **35.** 278-280. [1 ref.]

The cultural characters of an organism thought to belong to the genus *Clostridium* are recorded. It is a Gram-positive anaerobic sporulating bacillus with slightly swollen spores. It is non-proteolytic and ferments carbohydrates with slight gas-production. It produces a filtrable toxin under laboratory conditions, toxin production proceeding better at room temperature than at 37°C. The minimal lethal dose following subcutaneous inoculation of g. pigs was 0·02 c.c., or 3 c.c. following ingestion. Chickens were insusceptible. No cross-protection could be demonstrated against the toxin of this organism by antitoxin of *Cl. botulinum* Types A, B, C, or D.—E. J. PULLINGER.

AOKI, M. (1936). Weitere agglutinatorische Untersuchung der Aktinomyzeten. [**Agglutination Tests of Actinomycetes**].—*Z. ImmunForsch.* **87.** 196-199.

AOKI, M. (1936). Beziekung der agglutinatorischen Einteilung der Aktinomyzeten zu der nach der Komplementbindungsreaktion. [**Complement-Fixation Tests of Actinomycetes**].—*Ibid.* 200-201.

Using the aggl. test, A. claims to have identified three new serological types of *Actinomyces*, which show no cross agglutination with each other or with the types already recognized. These findings were confirmed by application of the complement-fixation test. A. now recognizes nine distinct antigenic types.

—E. J. PULLINGER.

MÜLLER, I. (1936). Adatok a rozsdagombákkal (Puccinia) fertőzött gabonanemuek állategészségügyi jelentőségéhez. [**Effect of Feeding Rust** (*Puccinia*) **Infected Fodder**].—*Mezogazdas. kutatás.* **9.** 1-9. 3 figs. [Numerous refs.] [German summary].

Six horses, three cattle and one sheep were fed on various fodder plants overgrown with *Puccinia*. In no case was any loss of health sustained, nor did alcoholic, ether, chloroform or aqueous extracts of the mould have any effect on test mice.

—Z. DE CSUKÁS (MAGYARÓVÁR).

MANNINGER, R., & BAKOS, M. (1937). A sugárgombabetegség oktanáról. [**The Aetiology of Actinomycosis**].—*Állatorv. Lapok.* **60.** 136-138. 5 figs. [1 ref.]

A brief account of actinomycosis.—Z. DE CSUKÁS (MAGYARÓVÁR).

SOLIS-COHEN, M. (1936). **Determining the Infectivity of Bacteria for Their Host. With Special Reference to their Pathogen-Selective Culture.**—*Lancet.* **231.** 1447-1450. [Numerous refs.]

The presence of an organism on a mucous membrane or in the secretion therefrom does not necessarily indicate infection with that organism. It is necessary to determine which of the bacteria present are of pathogenic significance for the host. Serological and intradermal tests, as well as Rosenow's selective affinity procedure, are regarded as unreliable for this purpose.

The following method is said to be the most simple yet the most reliable test available for clinical use :– material, collected from chronic or focal infections, is inoculated into deep rich culture medium and also rubbed on the bottom of a

sterile test tube (containing a few drops of broth to prevent drying). Into this tube is placed 3-5 c.c. of the host's fresh, whole, coagulable blood. Both are then incubated for 18-24 hours when smears and blood agar plates are made. The organisms which grow in the host's blood are regarded as of pathogenic importance.

—H. E. Bywater.

Goodpasture, E. W., & Anderson, Katherine. (1937). **The Problem of Infection as Presented by Bacterial Invasion of the Chorio-Allantoic Membrane of Chick Embryos.**—*Amer. J. Path.* **13.** 149-174. 15 figs. on 4 plates. [6 refs.]

The report of a method of cultivating various pathogenic bacteria on the chorio-allantoic membrane of living chick embryos. This procedure can in some instances serve as a biological test, the chick embryo taking the place of an expensive experimental animal. In addition to the question of expense, a chick embryo is subject to fewer uncontrollable outside influences than a laboratory animal which has lived for some while before coming under experiment. Eggs from a reliable source, and with a high standard of fertility are required; they are incubated for 1-2 weeks to promote development of the embryo; a window is then cut in the side of the shell, the chorio-allantoic membrane is seeded with the material to be examined and the aperture is sealed with a sterile coverslip. Smears and sections of the membranes can subsequently be prepared and stained and the cellular reaction to the inoculum studied. The following organisms have been found to develop on the membranes of chick embryos:– *Streptococcus viridans*, *Bacterium aerogenes*, *Salmonella typhi*, *Brucella abortus* and *Mycobact. tuberculosis* avian type.

—E. J. Pullinger.

DISEASES CAUSED BY PROTOZOAN PARASITES.

I. Corson, J. F. (1936). **Experimental Transmission of** *Trypanosoma gambiense* **by** *Glossina morsitans* **Through Monkeys.**—*Ann. trop. Med. Parasit.* **30.** 389-400. 3 tables. [3 refs.]

II. Robin, C., & Jospin, M. (1937). Recherches expérimentales sur *Trypanosoma gambiense.* Présence constante du trypanosome dans le moelle osseuse. Déductions pour le diagnostic et l'étude de la trypanosomiase humaine. [**Research on** *Trypanosoma gambiense.* **Constant Presence of Trypanosomes in the Bone-Marrow**].—*Bull. Soc. Path. exot.* **30.** 369-372. [2 refs.]

III. Robin, C., & Jospin, M. (1937). Sur un cas de transmission expérimentale transplacentaire de *Trypanosoma gambiense* chez le cobaye. [**Transmission of** *Trypanosoma gambiense* **in the G. pig** *via* **the Placenta**].—*Ibid.* 372-376. 2 tables. [13 refs.]

IV. Corson, J. F. (1937). **The Virulence of** *Trypanosoma rhodesiense* **in Relation to Cyclical Passage through** *Glossina morsitans.*—*Trans. R. Soc. trop. Med. Hyg.* **31.** 251-254. 1 table. [6 refs.]

I. In order to test the theory that the species of tsetse which acts as vector may influence the character of the trypanosome, C. transmitted a strain of *Tryp.g.* through a series of monkeys by cyclical passage in *G.m.* It retained its low virulence, and posterior nuclear forms were not encountered in monkeys. In one g. pig posterior nuclear forms appeared but only persisted for two days. It appears that *Tryp.g.* can be transmitted by *G.m.* without changing to the *rhodesiense* type, and the experiment failed to provide any explanation of the fact that human sleeping sickness is associated with *Tryp.r.* in *morsitans* areas and with *Tryp.g.* in *palpalis* areas. In countries where the two flies occur together it may be necessary to consider the possibility of a mixed infection.

II. The authors record investigations into the behaviour of a trypanosome strain of the *Tryp.g.* type, from the Ivory Coast, when transmitted mechanically in g. pigs. After the 40th passage the strain became practically monomorphic. In g. pigs killed in the last stages of the disease, when trypanosomes were rare in the blood, it was found that the bone-marrow was swarming with the parasites which were markedly polymorphic. In addition to the classical forms of the trypanosome, organisms occurred undergoing rapid multiplication; vacuolated forms were present and also a leishmanial form devoid of flagellum. Trypanosomes could be detected in the bone-marrow within 60 hours of inoculation, although they rarely appeared in the blood before the ninth day, and it is suggested that examination of marrow might be valuable as a method of detecting obscure human infection.

III. A g. pig inoculated with *Tryp.g.*, on the 23rd day of gestation, gave birth to two young which did not show a trypanosome infection until the sixth day and eighth day, respectively, after birth. They conclude that the infection of the offspring had occurred *via* the placenta. [It seems possible that infection occurred after birth].

IV. C. records experiments to compare the effects, on the virulence of a strain of *Tryp.r.*, of passage through g. pigs by cyclical transmission by *G.m.* and mechanical transmission by the syringe. The latter method appeared to increase the virulence of the strain for rats and mice, and this increased virulence was not reduced by subsequent passage through *G.m.*—U. F. Richardson.

Poursines, Y., & Soulié, P. (1936). Contribution à l'étude anatomo-pathologique de la trypanosomose du cheval de Syrie. [**Contribution to the Anatomopathologic Changes Met with in Animals Affected with the Equine Trypanosome of Syria**].—*3rd int. Congr. comp. Path. 1936.* **2.** 441-448. 5 figs. [In French].

A concise account of the tissue changes seen in various organs of the body as a result of infection with the equine trypanosome of Syria. The first part of the article deals with general histopathological alterations in the spleen, liver, kidneys, heart and nerve centres. The second part records the variations peculiar to infection in the rat, g. pig, rabbit and dog. The authors performed splenectomy on dogs both before and after infecting them with the parasites. The results they obtained indicate the important role the spleen plays in the fight against a trypanosome infection.—C. Davenport.

Archibald, R. G., & Mansour, H. (1937). **Some Observations on the Epidemiology of Kala-Azar in the Sudan.**—*Trans. R. Soc. trop. Med. Hyg.* **30.** 395-406. [5 refs.]

A. and M. have never been able to find leishmaniasis in dogs or other domestic animals in the Sudan, a fact which also holds good for India. Infection in dogs is, however, common in countries bounding the Mediterranean sea.

In a discussion on the paper reference was made to the transmission of the disease between human beings and the role of the dog as a carrier. It was agreed that mediate transmission by sandflies is the rule, though contact transmission is also believed to occur.—J. E.

Roubert, P. (1936). Recherches sur la leishmaniose canine dans la région de Montpellier. [**Canine Leishmaniasis in the Montpellier District, France**]. —*Thesis, Montpellier.* pp. 62. [Numerous refs.]

The greater part of the thesis is a general review of the French literature on

leishmaniasis in man and in dogs, NICOLLE having been the first to discover the infection in dogs in 1908.

R. examined 121 dogs from the Montpellier district by the globulin ring test and globulin precipitation test (" formol-leucogelification et les reactions à l'eau distillée "), by means of stained spleen smears and by cultivation of the parasite. 21 dogs were found to be affected (17·35 %).

One badly affected dog was treated with a course of 15 injections extending over three months of 30 cg. doses of " neostibosane ". Serological tests during the ensuing nine months yielded doubtful results, but at the end of the period the dog was found free from leishmania after death.

The control of the disease is discussed.—J. E.

ALBANESE, A. A., & SMETANA, H. (1937). **Studies on the Effect of X Rays on the Pathogenicity of** *Eimeria tenella*.—*Amer. J. Hyg.* **26.** 29-39. 5 tables. [14 refs.]

Satisfactory methods of controlling coccidiosis in chickens by physical and chemical means are so far unknown. Studies were made on the effects of X-rays on the oocysts of *E.t.* The results showed that experimental infection with oocysts treated with X-rays was much less severe than that produced by the controls. Greater mortality among the oocysts was evident when they were irradiated by high-intensity X-rays than when X-rays of lower intensity were used. Non-sporulated oocysts were more sensitive than sporulated oocysts and *in vitro* excystation was considerably reduced.—C. HORTON-SMITH.

BECKER, E. R., & MOREHOUSE, N. F. (1937). **Modifying the Quantitative Character of Coccidian Infection through a Dietary Factor.**—*J. Parasit.* **23.** 153-162. [13 refs.]

The experiments here described appear to have proved that the number of oocysts eliminated from experimentally infected rats can be materially reduced by manipulation of the components of the dietary formula. Contrary to previous belief it is revealed that vitamin G may be supplied in quantities adequate for normal host-growth and yet restrict the numerical increase of the coccidium. Yeast as a source of vitamin G, when present in the ration, stimulated oocyst production. When powdered liver was used as a source of the vitamin, oocyst production was reduced. In the authors' view reduced oocyst counts occur in the absence of some factor from the diet and not because of a positive arrestor of the development of the parasite. The hypothetical dietary factor responsible for coccidium stimulation is termed coccidibios. The criterion for judging the intensity of an infection was the number of oocysts eliminated.—C. HORTON-SMITH.

YAKIMOFF, W. L. (1937). **A Question of Priority in the Use of Name** *Eimeria mustelae*.—*J. Parasit.* **23.** 213.

Y. challenges the right, on the grounds of priority, of Dr A. A. KINGSCOTE to adopt the name *Eimeria mustelae* for a newly-described species from *Mustela visor*. Y's pupil, Miss P. S. IWANOFF-GOVZEM published descriptions of *Eimeria* species from *Mustela nivolis*: one of these species she named *E. mustelae*. Her published description of *E.m.* preceded that of KINGSCOTE by approximately three months. Y. suggests that KINGSCOTE should select another name.—C. H.-S.

WARREN, A. J., & COGGESHALL, L. T. (1937). **Infectivity of Blood and Organs in Canaries after Inoculation with Sporozoites.**—*Amer. J. Hyg.* **26.** 1-10. 4 tables. [17 refs.]

The work upon which this paper is based was undertaken with a view to

determining the presence or absence of infectious malarial parasites in the circulating blood during the period of incubation. Intramuscular and intravenous injections of sporozoites of *Plasmodium cathemerium* into canaries were made and it was found that the time required for the circulating blood to become infectious was much the same in both cases. Intramuscular injection of viable sporozoites was followed by an interval in which the circulating blood was non-infective when the parasites were found in the spleen, liver and bone-marrow. Similar observations were made in the event of dosage through the blood stream. Hence, a clearance mechanism has been demonstrated for a plasmodium in canaries.—C. H.-S.

I. Auger, L., & Basset, J. (1937). Myoglobinurie et piroplasmose du cheval. [**Myoglobinuria and Piroplasmosis in Horses**].—*Rev. Méd. vét., Toulouse.* **89.** 129-160. 5 figs. on 5 plates, 4 graphs. [10 refs.]

II. Yakimoff, W. L., & Owtschinnikoff, P. (1937). Nuttalliose der Pferde in Sibirien. [**Equine Piroplasmosis in Siberia**].—*Tierärztl. Rdsch.* **43.** 354.

I. Investigations were made into the causes of equine haemoglobinuria and jaundice in the neighbourhood of Lyons. Two conditions are considered to exist. One of these is due to *Babesia caballi* infection, and is characterized by fever, prostration, jaundice and oedematous swellings, haemoglobinuria being absent. Treatment with trypan blue gives satisfactory results. The second condition is an enzootic form of haemoglobinuria characterized by slight fever, muscular derangement and myositis, followed by myohaemoglobinuria, the urine being coffee-coloured and rich in albumin. The appetite is not impaired and there is no anaemia, but the disease progresses until the animal becomes recumbent through weakness. Profuse sweating occurs in the last stages. The mortality is 70%. The pathological lesions consist of gelatinous impregnation of the vascular connective tissue at the site of the myositis and round the kidneys and grooves of the heart. The kidneys may be double the normal size. Degeneration and necrosis of the fibrils of striated muscle occur, followed by autodigestion of the fibrils by the myoplasm and connective tissue cells. The kidneys show parenchymatous nephritis. The aetiology of the condition is discussed and it is suggested that it may occur independently of intervals of work and rest. Examination for bacterial or protozoan infection revealed nothing, but out of 12 attempts to transmit the infection to healthy horses by the inoculation of blood, two, in which large quantities of blood were used, proved successful. It is suggested the disease may be inoculable, but that the majority of the experimental animals used may have been immune.

II. The authors record the detection of a large ring form of piroplasm in horses in Siberia which they consider to resemble the nuttallia type.—U. F. R.

Endrejat, E. (1937). Ueber die durch Babesia ovis hervorgerufene Schafpiroplasmose. [**Ovine Piroplasmosis**].—*Tierärztl. Rdsch.* **43.** 40-41.

E. records work on the control of ovine piroplasmosis in Iran. Two dippings in 3% sodium arsenite at an interval of one week, followed by removal to clean pasture are recommended when large numbers of sheep are involved. In individual cases the injection (intraven.) of saline leads to recovery in 75% of the animals treated, and acaprin diluted 1 : 10 of water, and given in doses of 2-4 c.c., gave a recovery rate of 95%.—U. F. Richardson.

Brumpt, E. (1937). Cycle évolutif de *Piroplasma canis* chez Ixodinés. [**Development Cycle of *Babesia canis* in Ticks**].—*C. R. Soc. Biol. Paris.* **124.** 928-931.

The author reviews the literature dealing with the development of piroplasms

in ticks and records his own observations made on the development of *B.c.* in *Dermacentor reticulatus*. The babesia were found to multiply in the cells of the intestine and in the subcutis and muscles. Later the parasites were found in the walls of the ovaries, or in the salivary glands, in the form of sporoblasts which break up into small uninucleate forms. A dog was infected from ticks which had fed for five generations on a hedgehog and it is suggested that the parasite is able to develop in ticks indefinitely by the multiplication of the forms derived from the sporoblasts.—U. F. RICHARDSON.

SHARAF EL DIN, H. (1937). **Piroplasmosis in Geese in Egypt.**—*Rep. vet. Serv. Egypt, 1932-1933.* pp. 83-96.

Piroplasms were found in the blood of geese in two separate outbreaks of disease. The parasite, which is described, was noticed only in the cytoplasm of the red cells. It could not be distinguished from *Aegyptianella pullorum*. Sub-inoculation (presumably subcut.) of virulent blood into geese, ducks, fowls and pigeons conveyed the disease. The course of the disease is described.—F. H. M.

MLINAC, F. (1937). Početna istraživanja piroplazmoza živine u Južnoj Srbiji. Aegyptianella pullorum. [**Aegyptianella Infection of Fowls in Yugoslavia**].—*Jugoslov. vet. Glasn.* **17.** 92-94. 1 fig. [6 refs.] [German summary].

In Southern Serbia, Yugoslavia, intracorpuscular bodies have been repeatedly found in the blood of sick fowls, geese and ducks. M. thinks that these bodies are identical with those described by CARPANO as *Aegyptianella pullorum*. *Argas persicus* is considered to be the transmitter. Atoxyl, neosalvarsan and trypaflavine do not cure the condition, but after an inoculation of 0·2 c.c. of a 5% solution of acaprin complete recovery was repeatedly obtained.—B. OSWALD (SPLIT).

SERGENT, Ed. (1937). Représentation graphique des accès de maladie infectieuse par un " crisigramme ". [**Graphic Method of Representing the Reaction to Infectious Disease (Theileria Infections)**].—*C. R. Soc. Biol. Paris.* **124.** 248-250. 3 figs. [1 ref.]

S. describes the method of representing the reaction of groups of animals to theileria infections by means of charts in which the position of each individual reaction is recorded according to the maximum percentage of corpuscular infection during the reaction and the sum of the temperature reading above normal during the febrile period, expressed in centigrade. By connecting the positions denoting individual reactions, a figure, called a " crisigramme " is obtained, and is considered to represent the reaction of the group of animals. It is suggested that these " crisigrammes " supply a method of estimating the severity of reactions, and are useful in cross immunity experiments in judging the amount of immunity possessed by groups of animals.—U. F. RICHARDSON.

CRAIGE, A. H., Jr. (1937). **Post-Splenectomy Anaemia in a Cow; with a Note on the Eosinophile Curve.**—*J. Amer. vet. med. Ass.* **90.** 782-784. 1 table. [1 ref.]

Splenectomy was performed in order to precipitate a possible infection with *Anaplasma*, but at no time were *Anaplasma* observed in the blood. Only one examination of the blood was performed prior to the operation. After the operation, the red cells, haemoglobin and packed cell volume showed a gradual decline for two months, followed by a recovery to a level below that of the pre-operative level. The leucocytes fluctuated between 10,000 and 19,000 cells per c.mm. The

eosinophiles fluctuated with the sexual cycle, peaks above normal (180-1,800 per c.mm.) occurring at oestrus.—D. L. HUGHES.

DISEASES CAUSED BY VIRUSES.

GREAT BRITAIN. (1937). **Ministry of Agriculture & Fisheries. Fifth Progress Report of the Foot-and-Mouth Disease Research Committee.** pp. 386. Numerous figs., tables and graphs, 5 appendixes. [Numerous refs.] London: H.M. Stat. Off. [8vo] [7s.]

APPENDIX I.

Except where otherwise stated, by ANDREWS, W. H., ECCLES, A., HOLE, N. H., POLDING, J. B., LONGLEY, E. O., HAMILTON, A. A., & GRAHAM, A. M.

I. LONGLEY, E. O. **The Examination of Small Wild Animals for the Presence of Naturally Acquired Infection or External Contamination.** pp. 34-56. 17 tables.

II. —. **Naturally Contracted Foot-and-Mouth Disease in the Hedgehog.** pp. 56-63. 2 tables.

III. —. **Virus Strains Adapted to one Species of Host.** pp. 63-72.

IV. —. **The Study of Strains of Foot-and-Mouth Disease Virus Received from Southern Rhodesia and Bechuanaland** [in collaboration with BEVAN, L. E. W.]. pp. 72-99.

V. —. **Vesicular Exanthema of Swine.** pp. 99-104.

VI. —. **The Occurrence of Virus in the Blood, Milk and Urine of Cattle during the Course of Infection.** pp. 104-115. 3 charts.

VII. —. **The Duration of Immunity in Cattle and Swine.** pp. 115-129. 7 tables.

VIII. —. **The Differentiation of Immunological Types of Virus.** pp. 129-141.

IX. HOLE, N. H. **Some Experiments with Artificial Mixtures of the Recognised Types of Foot-and-Mouth Disease Virus.** pp. 141-160. 9 tables.

X. —. **Estimation of the Antibody Content of the Blood-Serum of Recovered Cattle and the Effect of Re-Exposure to Infection or Reinoculation.** pp. 160-190. 5 charts.

XI. —. **The Destruction of Virus in the Interior of Organs by the Agency of Heat.** pp. 191-194. 14 graphs.

APPENDIX II.

EDWARDS, J. T. **Studies upon Certain Features of Foot-and-Mouth Disease in Various Small Animals which present Different Degrees of Susceptibility to Infection, Namely :- Rats, Guinea Pigs, Field Voles, Hedgehogs.** pp. 195-268. Numerous tables, 4 charts. [19 refs.]

APPENDIX III.

I. GALLOWAY, I. A., & ELFORD, W. J. (1931). **Filtration of the Virus of Foot-and-Mouth Disease through a New Series of Graded Collodion Membranes.**—*Brit. J. exp. Path.* **12.** 407. Reprinted in *Report*, pp. 272-296. 4 charts, 12 tables. [Numerous refs.]

II. GALLOWAY, I. A., & ELFORD, W. J. (1933). **The Differentiation of the Virus of Vesicular Stomatitis from the Virus of Foot-and-Mouth Disease by Filtration.**—*Ibid.* **14.** 400-408. Reprinted in *Report*, pp. 296-303. 3 tables. [Numerous refs.] [*V. B.* **5.** 208].

III. BURNET, F. M., & GALLOWAY, I. A. (1934). **The Propagation of the Virus of Vesicular Stomatitis in the Chorio-Allantoic Membrane of the**

Developing Hen's Egg.—*Ibid.* **15.** 105-113. Reprinted in *Report*, pp. 304-313. 2 figs., 4 tables. [*V. B.* **4.** 726].

IV. GALLOWAY, I. A., & ELFORD, W. J. (1935). **Further Studies on the Differentiation of the Virus of Vesicular Stomatitis from that of Foot-and-Mouth Disease, with Particular Reference to a Rapid and Certain Method of Resolving Mixtures of the Two Viruses.**—*Ibid.* **16.** 588-613. Reprinted in *Report*, pp. 313-342. 13 tables, 3 charts. [13 refs.] [See *V.B.* **6.** 417].

V. GALLOWAY, I. A. **The Photodynamic Action of Dyes on the Virus of Foot-and-Mouth Disease.** pp. 342-345.

VI. GALLOWAY, I. A. **Experiments with Ticks.** pp. 345-349.

VII. GALLOWAY, I. A. **Resistance of Dried Foot-and-Mouth Disease Virus to Heat.** pp. 349-351.

VIII. GALLOWAY, I. A. **Experiments on Adsorption of the Virus of Foot-and-Mouth Disease.** pp. 353-364.

IX. GALLOWAY, I. A. **Experiments with Ducks and Seagulls.** pp. 364-369.

X. GALLOWAY, I. A. **Attempts to propagate the Virus of Foot-and-Mouth Disease in Eggs.** pp. 369-376. [Numerous refs.]

APPENDIX IV.

HARE, T. **Foot-and-Mouth Disease Lesions in the Ear Epidermis of Inoculated Guinea-Pigs.**—*J. Path. Bact.* **35.** 291-293. Reprinted in *Report*, pp. 377-378. [See *V. B.* **4.** 344].

APPENDIX V.

ELTON, G. **Report on Faunal Surveys of Foot-and-Mouth Disease Areas, in 1934-35.** pp. 379-386. 1 table.

This report covers the five-year period ending September 30th, 1935. Work was carried out at three centres – the Experiment Station at Pirbright (Appendix I), the Lister Institute, London (Appendix II), and the National Institute for Medical Research, Hampstead (Appendix III), and two supplementary research projects were undertaken by Dr T. HARE (Appendix IV), and ELTON, G. (Appendix V) respectively, the latter at the Bureau of Animal Population, Oxford University.

APPENDIX I.

I. In the previous report [see *V. B.* **2.** 78, 141, 144, 145 and 212.] it was found that out of 132 rats examined from the Station, F. & M. virus type 'O' was recovered in 6 cases by passage of tongue, pad and tail epithelium in g. pigs. Since 1930, the examination of rats from the Station and adjacent farm and from infected premises in the field has given the following results :– 1931, 121 rats examined—two positive, one type 'O' and one type 'A'; 1932, 81 rats examined – two positive, both type 'O', and 1933 and 1934, 250 examined—all negative. It may be noted, however, that since 1933 all rats were autopsied in a special isolation unit where no other F. & M. work was being undertaken. None of these infected rats came from premises where field outbreaks were occurring.

In most instances, the lesions in rats were slight although g. pigs inoculated with suitable tissues developed generalized lesions. Retransmission to the wild rat, however, was only effected with difficulty. The occurrence of purulent pad-lesions in g. pigs inoculated with suspected rat material is noted. They were apparently not due to F. & M. virus, but could lead to confusion.

With the exception of one hedgehog, which was positive, other wild animals caught on infective premises were free from virus.

II. A hedgehog was caught on infected farm premises. In spite of the absence of visible lesions, virus was demonstrated in the skin and most of the

organs. It was readily transmitted to g. pigs and to bovine animals by inoculation. Cross-immunity experiments showed that the hedgehog strain was identical with that obtained from cattle in the same outbreak and was of the ' O ' type.

The virus was readily propagated in hedgehogs from which it was transmitted to cattle by contact, and *vice versa*. Tests of the organs of artificially infected hedgehogs showed that the virus was present in all the tissues. [In view of the fact that the blood was also infective and apparently no attempt was made to free the organs from blood, the significance of this finding is obscure].

III. Two strains of F. & M. virus, one of which was obtained from Rhodesia, were of full virulence for cattle under both natural and experimental conditions, but were almost apathogenic for pigs. On the other hand, three strains from field outbreaks in which pigs alone were affected, produced typical eruptions in experimental pigs, but were at first without effect on cattle. After exaltation of virulence by passage through pigs, both strains set up lesions in bovines after inoculation, but still appeared unable to infect cattle by contact. The third strain was even more specific for the pig.

A virus received from Rotterdam also behaved in a similar manner. This strain, however, had been recovered from a cow from which it had been transmitted to the pig by way of the g. pig. Reasons are given why these strains are not related to porcine " vesicular exanthema ".

IV. In 1931, an outbreak of an unusual type occurred in Southern Rhodesia [see *V. B.* **3.** 243, and **4.** 233]. The disease was mild in character and no evidence could be obtained that it spread by indirect means. Parenteral inoculation of infective material was usually unsuccessful, but the disease was induced by nasal instillation.

From 1931 to 1935, eight strains were sent to England. Preliminary tests clearly indicated that the virus was that of F. & M. disease, giving rise in English cattle to symptoms indistinguishable from those induced by European strains, and was readily transmitted by contact. These viruses were of low pathogenicity for pigs and goats, but this has also been noted with certain European viruses [see III above]. Considerable difficulty was also experienced in adaptation to the g. pig.

Cross-immunity experiments in g. pigs showed that five strains conformed to the ' O ' type. One strain at first presented some difficulty but after complete adaptation it behaved as the others. In cattle, however, different results were obtained since all the Rhodesian viruses broke down the immunity of cattle resistant to ' O ' and *vice versa*, whereas cattle immunized with one Rhodesian virus were resistant to the others (31 months). A 1934 strain, on the other hand, was quite distinct. In the g. pig it had no affinity with ' O ' or ' C ', but had some link with 'A' and was classed as an 'A' variant. A similar result was obtained with a 1935 strain.

A strain obtained from Bechuanaland in 1933 was infective for cattle but not at first for g. pigs, but was established in the latter by passage through English cattle. In cross-immunity experiments it seemed similar to the Rhodesian viruses. A 1934 strain, however, was immunologically distinct. In cattle, it broke down the immunity of animals protected against ' O ', 'A', ' C ' and Rhodesian viruses (1 to 6) respectively, but not those immunized against the 1934 Rhodesian strain which were fairly resistant. After continued passage through the g. pig, it showed a distinct affinity with 'A' type.

The significance of these findings is discussed in relation to the observations of DAUBNEY on similar African strains [see *V. B.* **5.** 269].

V. A strain of the virus of " vesicular exanthema of swine " was obtained from the U.S.A. In confirmation of American work, it was found that it induced

in swine lesions very similar to F. & M. disease. Some minor differences in the development of the lesions were noted, but they were not of differential significance. It was apathogenic for horses, cattle, sheep, goats, g. pigs, wild rats and hedgehogs. Pigs immune to ' O ', 'A' and ' C ' respectively were fully susceptible to this virus.

VI. Blood, milk and urine collected from cows suffering from F. & M. disease, ' O ' type, were tested intradermally on g. pigs. The results were relatively consistent. In the blood, virus was found from the 49th to 89th hours, *i.e.* shortly before vesication commenced until this stage had passed. No correlation was detected between circulating virus and the infectivity of milk and urine in which the virus was found at irregular periods.

VII. Previous work on the duration of immunity in cattle has been confirmed. 51 animals immune to ' O ' were tested at various intervals. In one group of 17 tested intramuscularly, complete immunity was observed up to 32 months after a single exposure to infection and up to 56 months after several intramuscular injections of homologous virus. Similarly, 17 cattle tested by contact with infective donors were immune for 2 to 3 years. Different results were obtained by intralingual inoculation where the results were inconstant. In a group of 17 animals, a few resisted after 2 years, but in the majority of cases, the immunity was waning by the sixth month. Limited observations suggest that the other types of virus behave in a similar manner.

In pigs, no clear-cut differentiation between local and general immunity could be detected. In some cases an immune state was still in existence after 18 months, but in most instances it was breaking down by the end of the tenth month.

VIII. From time to time strains have been obtained which do not fall into the three main classes, *viz* ' O ', 'A' and ' C '. During the period 1930-1934, 88 strains were examined. In the first place, they were adapted to the g. pig and were then tested by cross-immunity tests in animals resistant to ' O ', 'A' and ' C ' respectively. As a result, the following results were obtained :- 51 were classified as ' O ', 22 as 'A' and 2 as ' C ' while 13 could not be determined with certainty.

A full type determination of each strain in cattle was obviously too costly, but a proportion was tested in animals immune to ' O '. At a later stage when the ' O ' type was no longer predominant in field outbreaks, complete type classification in 'A' and ' C ' immunes was undertaken with a few strains.

In addition, three unclassifiable strains were selected for a detailed study in cattle. The first gave indications of possessing components belonging to ' O ' and ' C ' : there were ten other strains with similar affinities. A second virus appeared to be related to ' O ' and 'A' types : one other strain of this type was encountered. A third strain was even more complex and appeared originally to be composed of ' C ' mixed with some unknown component. When adapted to the g. pig, however, two distinct substrains were obtained, one being a pure ' C ' and the other a pure ' O '. The full details of the cattle experiment are too voluminous for abstraction and should be consulted in the original. In general the results suggest that some of these strains are complex and are not fixed.

Since experiments run in parallel in the g. pig often gave a different answer to the result in cattle, it is obvious that data obtained in the former must be accepted with caution.

IX. In view of the results obtained in the previous section [see VIII above] g. pigs were inoculated with mixtures of the recognized types in order to determine whether mutation was likely to occur or whether certain components might disappear on serial passage.

The segregation of the component parts of artificial mixtures was effected in

two ways, *viz* (a) a method depending on the fact that if an x + y mixture is inoculated into a g. pig immune to x, the y component alone appears in the generalized lesions, and (b) based on the observation that the virus does not pass into the blood stream in immune animals, but is readily recoverable from susceptible animals. A mixture of viruses can be readily sorted out by means of series of animals immune to each of the known types. It was necessary to use reasonably large groups of immune animals since slight variations in individual response were likely to arise and lead to anomalous results. G. pigs inoculated simultaneously with a mixture of two types of virus were subsequently immune to both.

When a mixture of two viruses is passaged in series from pad to pad one strain may tend to dominate the other. Thus, in a mixture of 'O' and 'A' types, the latter tends to disappear leaving a pure 'O' strain.

X. Blood sera were collected from cattle recovered from an 'O' type of virus over periods varying from one to twenty months and were tested in g. pigs to assess their protective value. Different doses of the sera were given subcutaneously and the virus inoculated simultaneously in the pad. The value of the sera was judged by their ability to prevent generalized lesions. Only two sera gave regular protection while two behaved irregularly – the remainder were quite inert. The antibody content could be raised, however, by a reinoculation of virus or by exposure to infection in proportions of 80% and 50% respectively.

Tests of a polyvalent serum ('O', 'A' and 'C') were also undertaken in cattle and pigs. The serum in a dose of 0·4 c.c. protected g. pigs against any one of the three standard strains, but in cattle and pigs in doses of 200 c.c. and 40 c.c. respectively, it entirely failed to prevent vesicle formation following intramuscular inoculation of virus. It also failed to afford complete protection against direct contact with infective animals although in some instances the severity of the lesions was modified to some extent. The moderate passive immunity this induced tended to decline rapidly after 24 to 48 hours. Attempts to assess the value of the serum against indirect contact infection, *i.e.* placing animals in infected stalls, were unsuccessful on account of the failure of the controls to contract the disease.

XI. The survival of F. & M. virus in the centre of sweetbreads after heating was studied. The virus was introduced into the centre of the organ either in the form of sections or emulsions of infected g. pig pads, or in sealed vials. In some cases the organ was immersed in cold water and brought to the boil, while in others it was plunged directly into boiling water. The temperature of the centre of the organ was registered by means of a thermo-couple pyrometer. After heating for a definite period and cooling, the central tissues were inoculated into g. pigs.

In a small proportion of cases, virus was still recoverable. In commenting on these results, it is remarked that

"Although there were few positive inoculations, it would appear that there was very little margin of safety, in connection with these organs, when the time required for the water to reach boiling point fell below 12 minutes. With the largest specimen (320 gms.) a period of 12 or 13 minutes did not appear to give as high an internal temperature as might well be thought necessary. With these particular organs it would appear desirable, in order to ensure certain freedom from living virus, either to prescribe a period of boiling in excess of 5 minutes, or to require the process to begin with immersion in cold water, and to prescribe boiling for 5 minutes to follow preliminary heating for not less than 15 minutes".

Appendix II.

In view of the irregularities in the reactions of rats to the virus of F. & M. disease, E. has made a detailed study of the influence of age, diet etc. on susceptibility to infection. The G.F. strain was used in practically all the experiments on account of the regularity with which it infects g. pigs in minimal doses.

The first experiments, undertaken in white rats, aimed at detecting the relative susceptibility of well-fed and underfed animals. The former were maintained on the normal diet of KORENCHEVSKY [(1922). *Spec. Rep. Ser. med. Res. Coun., Lond.* No. 71. p. 71.] while the latter received a bread and milk diet. In the well-fed group, large local lesions appeared 48 hours after inoculation, while generalization was the rule, whereas in the underfed group local lesions were tardy in appearing and generalized lesions were not distinct. The most striking divergence was noted between underfed and well-fed males as compared with females.

More detailed experiments with various diets were then carried out to determine the constituents which were responsible. In one instance, one group received bread and milk only, a second group bread and milk plus wheat germ, salt mixture and hemp seed and a third group a more complex diet with yeast, carrot, etc. The animals in group III were by far the most susceptible. Further experiments indicated that rats with severe vitamin A deficiency reacted poorly or not at all to the virus. The addition of raw liver appeared to increase susceptibility.

In regard to age, both very young and very old rats were less susceptible than rats which were sexually mature but had not completed their growth. Young rats inoculated intradermally with large doses of virus failed to react but were subsequently immune, while foetuses injected *in utero* were resistant to reinoculation up to 68 days after birth.

Similar results were noted in the susceptibility of young and medium-sized g. pigs although the differences were not so great. As in the rat there was an increasing susceptibility to infection with age, the most severe reactions occurring in animals about 500 g. in weight. The dose required to infect both young rats and young g. pigs was about 100 times that necessary to induce lesions in adults.

Estimations of the virus content of the internal organs of rats inoculated intradermally with massive doses of virus showed that in old animals no virus was detectable whereas in medium-sized animals it was readily recoverable from many sites. No evidence was obtained that tame rats were less susceptible than wild rats provided that both groups received suitable diets.

APPENDIX III.

Sections II, III & IV—(see titles).

V. Preliminary observations on the resistance of F. & M. virus to irradiation have been confirmed. In some instances the virus was completely inactivated by the photodynamic action of methylene blue in one hour, but not in every case. These variations were due to differences in the original titre of the virus. The virus was also resistant to neutral red, eosin and other dyes in this group, to certain acridine dyes *viz* 3 : 7 tetramethyl diamino 10-cyano-5-methyl acridine etc., and to three cyanine dyes. On the other hand, it was comparatively sensitive to proflavine, " rivanol ", acriflavine, 3 : 7 diamino 10-cyano-5-methyl acridine etc.

More exhaustive tests were made with proflavine, " rivanol " and acriflavine and the times necessary for inactivation were worked out. Virus suspensions rendered inert by these three dyes were tested for their protective potentialities in g. pigs. All three were similar in their effects and were comparable in efficiency to inactivated formalinized virus. When given in sufficient amounts they prevented the appearance of generalized lesions.

VI. Although there is little evidence from field outbreaks of F. & M. disease that recurrent cases on re-stocked premises might be due to transmission by insect vectors, the possibility that such infections might arise could be postulated if it could be shown that ticks etc. can carry the virus.

Preliminary experiments were undertaken with *Argas persicus* which, by removal of the front tarsi, was induced to feed on infective g. pigs. Virus was recovered from the 24th hour to the 14th day after removal from infective animals.

The presence of virus was determined by crushing the ticks and inoculating g. pigs intradermally. The results, however, were not constant. G. pigs were also successfully used for feeding *Ixodes ricinus*. The methods of hatching and manipulation of the larvae, nymphs and adults are given in detail. No evidence was obtained that the virus would survive the moult from larva to nymph or from nymph to adult female. Larvae hatched from eggs of females fed on infective g. pigs were also free from virus.

VII. G. pig vesicle lymph of high titre was diluted with broth before and after filtration, and was also diluted with milk. All three suspensions were dried in small amounts in thin-walled vials *in vacuo* over P_2O_5. The dried suspensions were then subjected to high temperatures for measured periods.

In the case of completely dried virus (filtered and unfiltered) infectivity was not lost in samples exposed to 130°C. for 1 minute, 120°C. for 3 minutes, 110°C. for 5 minutes. Completely dried virus in milk resisted 100°C. for 2 minutes or 90° to 95°C. for 5 minutes. With less completely dried samples, the virus was not so resistant to high temperatures.

VIII. A series of experiments was completed on the adsorption and elution of virus on various substrates. Recovery after adsorption on charcoal, calcium phosphate, coagulated proteins and collodion particles was poor, but satisfactory results were obtained with Kieselguhr and kaolin, particularly the former. Maximum adsorption occurred at a pH of about 6·6 to 7·0 while complete elution was effected by liquids with a reaction of pH 8·0 to 9·2. Dilutions of virus which were too weak for detection by g. pig inoculation, were concentrated by adsorption and then gave positive results. In these instances, the precipitates were suspended in a small amount of fluid at pH 8·0 and inoculated intradermally into g. pig pads without previous centrifugation.

Preliminary experiments on the recovery of virus from bovine urine were not encouraging owing to the wide fluctuations in the reaction of normal urines and the difficulties which were experienced in preparing a stable urine of constant pH value. Eventually a satisfactory method was found in the addition of M/1 KH_2PO_4 coupled with adjustment of the CO_2 tension to maintain the reaction at pH 7·0. Under these conditions the virus was readily removed by adsorption. Virus was recovered in some instances from the urine of infected or recovered g. pigs from the 24th day up to the 7th day after inoculation. Similar experiments in cattle were unsatisfactory owing to the low titre of the infecting virus.

The acetone-precipitation technique of Waldmann, Trautwein and Pyl [*V. B.* **1.** 212.] was not confirmed.

IX. Several ducks were inoculated with a potent virus in the web of the foot. No definite lesions were observed, although virus was recovered from the site of injection up to the 48th hour (3 days in one case only). In a second series, the virus was injected into the horny pads at the base of the foot. Eight successful passages were made in this manner from duck to duck.

Limited experiments in seagulls resulted in infection in the case of one common gull (*Larus canus*) which developed a large vesicle on the upper surface of the web. This was the only positive result recorded and the general trend of the experiments suggested that gulls are not very susceptible to infection.

X. The virus was inoculated on to the chorio-allantoic membrane of 58 developing hens' eggs. The membranes were tested for infectivity at varying periods (24 hours to seventh day), but in no case was virus recovered. The virus was also superimposed on membranes which were already infected with the agent of canary pox, but no lesions of F. & M. disease developed in g. pigs inoculated with these membranes: moreover, membranes on to which g. pig embryo tissues had been grafted, were also insusceptible to infection.

The results with ducks' eggs, however, were slightly more encouraging. Virus was recovered from 42 out of 134 and in some cases successful transference was recorded to the 2nd or 3rd generation. Nevertheless, it proved impossible to establish the virus permanently in ducks' eggs and no clear-cut evidence of multiplication could be obtained.

APPENDIX IV—(see title).

APPENDIX V.

During 1934-1935, the Bureau of Animal Population carried out local surveys on wild fauna on seven premises where F. & M. disease had occurred in the farm stock. The relative proportions of the various species are given in a table.

Owing to their high susceptibility to the disease, special attention was paid to hedgehogs. In general, the evidence pointed to a scarcity of these animals in F. & M. areas (incidentally, it is suggested that this is attributable to the existence of a wide-spread mortality of unknown aetiology in this species). However, a small number of hedgehogs was found on infected premises. Some were examined at Pirbright, but with one exception all were negative [see above – appendix I Section II]. It is suggested, nevertheless, that this species may act as a reservoir of the virus : in addition, there are strong possibilities that brown rats, foxes and birds may act as mechanical carriers.—R. E. GLOVER.

I. FRENKEL, H. S. (1936). Agglutinatie van mond- en klauwzeervirus. [**Agglutination of Foot and Mouth Disease Virus**].—*Versl. werkzaam. Staatsveearts. Onderzoek.-Inst. 1935.* pp. 9-18. 2 tables. [5 refs.] [English, French and German summaries].

II. FRENKEL, H. S. (1937). Les méthodes de culture des virus filtrables et du virus aphteux en particulier. [**Virus Cultivation with Special Reference to Foot and Mouth Disease**].—*Bull. Off. internat. Epiz.* **14.** 208-222. Discussion pp. 439-446. [1 ref.]

III. FRENKEL, H. S. (1936). Over het kweeken van mond- en klauwzeersmetstof op huidexplantaten van runderembryo's, welke gedurende eenige dagen door koude geconserveerd waren. [**Culture of Foot and Mouth Disease Virus on Bovine Embryonic Skin, Kept Cold for Some Days**].—*Versl. werkzaam. Staatsveearts. Onderzoek.-Inst. 1935.* pp. 22-25. 1 fig. on 1 plate, 2 tables. [English, French and German summaries].

IV. FRENKEL, H. S., & VAN WAVEREN, G. M. (1937). La culture du virus de la fièvre aphteuse dans les explantations de la peau embryonnaire porcine. [**The Culture of Foot and Mouth Disease Virus on Explants of Embryonic Porcine Skin**].—*Bull. Off. internat. Epiz.* **13.** 845-846.

V. FRENKEL, H. S., & VAN WAVEREN, G. M. (1936). Over het kweeken van mond- en klauwzeersmetstof op huid-explantaten van runder- en schapenembryo's. [**Culture of Foot and Mouth Disease Virus on Bovine and Ovine Embryonic Skin**].—*Versl. werkzaam. Staatsveearts. Onderzoek.-Inst. 1935.* pp. 30-40. 4 tables. [English, French and German summaries].

VI. FRENKEL, H. S., & VAN WAVEREN, G. M. (1936). Beinvloedning der mond- en klauwzeereruptie door cantharideblaren. [**Influence of Cantharides Blisters on Foot and Mouth Disease**].—*Ibid.* pp. 26-29. [1 ref.] [English, French and German summaries].

VII. JANSSEN, L. W. (1936). Over mond- en klauwzeervirus. IV. Pogingen tot vaccinatie met onoplosbaar gemaakt virus. [**Foot and Mouth Disease. IV. Immunization with Insoluble Virus**].—*Ibid.* pp. 41-58. [5 refs.] [English, French and German summaries].

VIII. FRENKEL, H. S. (1937). Recherches sur la fièvre aphteuse exécutées à l'aide de la subvention de l'Office international des Epizooties. [**Research on Foot and Mouth Disease**].—*Bull. Off. internat. Epiz.* **14.** 345-350. [2 refs.]

IX. FRENKEL, H. S., & WAVEREN, G. M. (1937). La culture du virus de la fièvre aphteuse dans les explantations de la peau embryonnaire porcine. [**Cultivation of Foot and Mouth Disease Virus in Embryonic Porcine Skin Explants**].—*Ibid.* 351-352.

I. F. & M. virus may be absorbed on to colloids such as kaolin, and the colloidal particles may then be agglutinated in the presence of serum and electrolyte. Such agglutination is, however, entirely non-specific, so that the reaction is valueless either for the differentiation of various types of virus or even for the simple serological diagnosis of F. & M. infection.

II. A discussion of the known methods of cultivating F. & M. virus. Successful cultivation is a necessary preliminary to the successful control of the disease by vaccination, since it is first essential to prepare a standardized and efficient vaccine. Any method of cultivation suitable for vaccine preparation must allow of the rapid production of large amounts of virus which is avirulent in character but retains its immunogenic properties.

III & IV. F. & M. virus grows readily in embryo skin of certain animals. Skin is removed from bovine, ovine or porcine embryos in a sterile manner and is minced and mixed with F. & M. virus and the mixture is refrigerated. Thereafter it is seeded into Tyrode solution containing sodium phosphate and defibrinated bovine plasma. If the tissue culture is successful and fibroblasts multiply, there is a concurrent multiplication of virus. Large amounts of virus may thus be obtained since embryos, particularly of the multiparous pig, are easily obtained.

V. Notes regarding certain technical aspects of the cultivation of F. & M. virus in embryonic tissue culture. The addition to the tissue culture of 70% alcohol, cooled to –15°C., controls bacterial contamination to a large extent without affecting the virus or tissue culture adversely. Virus is adsorbed on to minced embryo skin better if the mixture is stored under a partial vacuum. Tissue-virus mixture can be refrigerated for at least six days before being subcultured into Tyrode medium. Cultivation of virus in unminced skin lowers the frequency of bacterial contamination but also considerably lowers the yield of virus.

VI. The production of artificial blisters on the skin of g. pigs infected with F. & M. virus, by means of cantharides ointment, results in a milder virus eruption than usual, provided that the artificial blisters are provoked 24-48 hours before the virus reaction.

VII. The aim in producing a suitable vaccine strain of virus is so to alter the virus that it can no longer penetrate the cells for which it has a special affinity, whilst retaining its immunogenic characters intact. F. & M. virus may be converted into a coarse " insoluble " form by the action of glycerin, alcohol and ether at 10°C. Intracardial injection of g. pigs with virus treated thus often resulted in successful immunization following a mild or even negligible reaction. In certain cases the immunity obtained with a monovalent vaccine functioned satisfactorily against heterologous virus types. Simultaneous inoculation of such virus with immune serum produced no durable immunity.

VIII & IX. Cover the same ground as the foregoing articles.—E. J. P.

CORNELL, R. L., & EVANS, S. A. (1937). **On the Value and Limitations of Tissue Vaccines against Rinderpest.**—*J. comp. Path.* **50.** 122-135. 3 tables, 5 charts. [9 refs.]

Controlled experiments on 31 cattle to compare incubated glycerin spleen vaccine with formolized glycerin spleen vaccine are recorded, and it is concluded that there is no marked difference between their antigenic properties. With both types of vaccine a useful immunity was produced, but a solid immunity was not produced in all animals. Comparison is also made with experiments previously carried out. Two instances are recorded in which vaccinated animals contracted rinderpest by contact with other vaccinated animals that were given virus in the course of a test of their immunity. There is no less risk of infection from such animals (even in some cases of a blocked-out reaction) than from naturally infected animals.

There is a discussion on the nature and effect of blocked-out reactions and of the alternative sequelae which may follow the injection of rinderpest virus into a vaccinated animal. Practical applications are considered.—E. E. JELBART.

I. BALOZET, L. (1937). L'immunité dans l'anémie infectieuse des équidés. [**Immunity in Equine Infectious Anaemia**].—*Cah. Med. vét.* **7.** 133-135.

II. PANISSET, M. (1937). Historique et répartition géographique de l'anémie infectieuse des équidés au Canada. [**Equine Infectious Anaemia in Canada**]. —*Ibid.* 136-138.

III. BALOZET, L. (1937). Études expérimentales sur l'anémie infectieuse des équidés. (IV) Essais d'inoculation à d'autres espèces animales. [**Studies on Equine Infectious Anaemia. IV. Susceptibility of other Animals**].—*Arch. Inst. Pasteur Tunis.* **26.** 27-35. [Numerous refs.]

I. This short review on immunity in E.I.A., points out that, although animals recovering from an attack of the disease show some immunity to a second infection, there is no true active immunity, nor is passive immunity possible. It is suggested that resistance of recovered animals is similar to that found in tuberculosis, brucellosis, and in some protozoan diseases, in which inoculation with a non-virulent strain of the organism may protect the animal against the natural disease.

II. The first allusion to the presence of E.I.A. in west Canada would appear to have been made by PAUL KANE in 1855, when he spoke of the high death rate west of Fort Garry (now Winnipeg) in horses, due to a parasite that from his description resembles *Gastrophilus.* In 1888, RUTHERFORD described the disease and misnamed it " American Surra ", suggesting a protozoan infection. This was contradicted by the work of VALLÉE and CARRÉ, 1903, who showed that the disease was due to an ultravisible virus. The disease appears to have spread from Manitoba to the west, until held up by the Rocky Mountains, and to the east, through Ontario to Quebec.

III. Experimental animals were given an inoculation of infective blood, and later were killed, and their blood, and in some cases parts of selected organs, was inoculated into donkeys. The development of E.I.A. in the donkeys was taken as the criterion necessary to show infection of the experimental animals.

A limited number of rabbits, g. pigs, rats, and fowls were used but none were found susceptible. A monkey and a sheep were also found to be insusceptible, but eight days after receiving doses of infected blood amounting to 950 c.c., the blood of the sheep proved infective to a donkey. This was assumed to be due to the slow elimination of the injected virus.—H. H. HOLMAN.

I. HOWITT, Beatrice F. (1937). **Complement Fixation Test Differentiating 3 Strains of Equine Encephalomyelitic Virus and the Virus of Lymphocytic Choriomeningitis.**—*Proc. Soc. exp. Biol., N.Y.* **35.** 526-528. [4 refs.]

II. HOWITT, Beatrice F. (1937). **Method of Transmission of Immunity to**

Equine Encephalomyelitic Virus in the Guinea Pig.—*J. infect. Dis.* **61.** 88-95. 3 tables. [12 refs.]

III. Lazarus, A. S., & Howitt, B. F. (1937). **Ultrafiltration of Virus of Equine Encephalomyelitis (Russian Strain, Moscow No. 2).**—*Proc. Soc. exp. Biol., N.Y.* **36.** 595-596. [5 refs.]

IV. Wyckoff, R. W. G. (1937). **Ultracentrifugal Concentration of a Homogeneous Heavy Component from Tissues Diseased with Equine Encephalomyelitis.**—*Ibid.* 771-773. 4 figs. [10 refs.]

I. H. records the successful differentiation of strains of equine encephalomyelitis virus (eastern and western American types and type Moscow No. 2) and the virus of lymphocytic choriomeningitis by means of the c.f. test. Specially prepared brain virus antigens were used. Positive fixation occurred between hyperimmune serum and the homologous virus antigen, but not between the same serum and heterologous antigens or in the presence of normal g. pig brain or Borna antigens. In one series of experiments the immune sera were subjected to neutralization tests in addition to tests for complement-fixation, and the results indicated a connexion between the two reactions.

II. H. made a study of the resistance factor or immunity of young g. pigs which were born of parents immune to the virus of eq. enceph. and found that the young, weaned or unweaned, from parents immune to the American strains were immune for a period of about one month. No change in the degree of immunity was detected when the young were transferred to normal mothers on the day of birth and normal young g. pigs which had been transferred to immune mothers did not develop immunity. The young born of g. pigs immune to the Russian Moscow No. 2 strain of virus were found to be lacking in acquired tissue immunity; they developed the disease on intracerebral inoculation with the homologous strain of virus.

Virus-neutralizing antibodies to all three strains were detected in the adult and foetal sera of immune pregnant g. pigs. In view of the recovery of the American strains, but not the Russian strain of virus from the foetal tissues after intracerebral inoculation of pregnant g. pigs, the invasiveness of the former types of virus is emphasized. Reference to this finding with regard to the development of tissue immunity in young g. pigs born to parents immune to the American strains of virus is noted.

It is concluded that the immunity of young g. pigs to the American strains is obtained from their mothers by way of the placenta and not from their milk.

III. Working with collodion membranes prepared according to the method of Elford the filtration end-point of the Russian strain (Moscow No. 2) of eq. enceph. virus was determined. The particle size of the virus was found to be 85-130 $m\mu$ while under the same filtration conditions the eastern and western American strains of encephalomyelitic virus were found to have a particle size of less than 40 $m\mu$.

IV. W. refers to the use which has been made of the air-ultracentrifuge in extracting and purifying several of the less stable virus proteins causing plant diseases, and record is made of similar ultracentrifugal examination of suspensions of tissues containing the virus of eq. enceph. The purified suspensions obtained were examined with an analytical ultracentrifuge arranged for photography. A sharp sedimenting boundary similar to that obtained from a homogeneous heavy protein of a comparable uniformity of particle size was observed. This heavy component was short lived, little of it appeared in the sedimentation picture after a few hours and only a trace after standing for a day or two.

Diffusely sedimenting boundaries are also described. These boundaries were

not found when similar healthy tissues were subjected to control ultracentrifugation. On making a comparison with proteins and the smaller viruses it is suggested that the size of the particles forming the heavy component would be about 40 $m\mu$.
—D. R. WILSON.

SCHNEIDER, J. E. (1936). **The Utilization of Sheep in the Rabies Vaccine Protection Tests.**—*J. Amer. vet. med. Ass.* **89.** 671-677. 2 tables. [1 ref.]

Two phenolized vaccines, prepared from infected rabbit and horse brain and cord respectively, were inoculated into rabbits and sheep. The rabbit vaccine afforded complete protection to rabbits against the subsequent intralingual inoculation of virus by a single 5 c.c. dose or 14 doses of 0·5 c.c. each. Equally good results were obtained by the vaccination of sheep with single 5 c.c. doses or six daily doses of 5 c.c. each of the horse vaccine.

The author considers that the sheep is more suitable for rabies vaccine protection tests than the dog as they found that its health is less impaired during the test period.—E. C. HULSE.

I. DE LA RIVIÈRE, R. D., & CLIEVÉ, J. (1936). La grippe du furet. **[Influenza in Ferrets].**—*Mouvem. sanit.* **13.** 538-549. 1 fig. [2 refs.]

II. MAGILL, T. P., & FRANCIS, T., Jr. (1936). **Antigenic Differences in Strains of Human Influenza Virus.**—*Proc. Soc. exp. Biol., N.Y.* **35.** 463-466. 2 tables. [7 refs.]

III. SCHERP, H. W., & CHAMBERS, L. A. (1936). **Resistance of the Viruses of Poliomyelitis, Human Influenza and Swine Influenza to Intense Vibration.** —*Ibid.* 495-500. 2 tables. [11 refs.]

IV. STRAUB, M. (1937). **The Microscopical Changes in the Lungs of Mice Infected with Influenza Virus.**—*J. Path. Bact.* **45.** 75-78. 11 figs. on 4 plates. [3 refs.]

V. MCINTOSH, J., & SELBIE, F. R. (1937). **The Pathogenicity to Animals of Viruses Isolated from Cases of Human Influenza.**—*Brit. J. exp. Path.* **18.** 334-344. 5 figs., 6 tables. [8 refs.]

I. An account of human influenza virus infection in the ferret.

After intranasal instillation of virus without anaesthesia, ferrets show a typical diphasic thermal reaction, the maximum temperature being recorded on the 2nd and 5th days. There is a muco-purulent discharge with nasal obstruction. Death is exceptional and recovery occurs in 10-15 days. Pulmonary lesions are seen after infection under anaesthesia.

Direct transmission of the virus from an infected ferret to man has occurred, typical influenza lesions being shown. The duration of immunity in the ferret is five to six months.

Swine influenza virus produces typical influenzal symptoms in ferrets, which are indistinguishable from those produced by the human type. Ferrets recovered from infection with the swine virus are immune to infection with the human type. Ferrets recovered from infection with the human virus are not completely resistant to infection with the swine virus.

II. Three rabbits were inoculated (intraperit.) with two strains of human influenza virus and one swine strain respectively. Neutralization tests were then performed on mice with the serum and tissue culture virus. Each serum neutralized completely the homologous virus strain, but neither human strain neutralized the swine virus although the swine strain serum neutralized one of the human strains. It is suggested that the swine virus comprises a more complex antigen than the human strains.

III. Preparations of the viruses of poliomyelitis, human influenza and swine influenza were exposed to intense sonic vibrations (7,000 c.p.s.) for periods up to 60 minutes; the pathogenicity of these viruses remained unaltered. Exposure of *Streptococcus haemolyticus* to this sonic vibration is sufficient to cause disintegration of the bacteria. Homogeneization of the virulent material by intense sonic vibration did not increase the activity of the virus.

IV. The primary lesion in mice is necrosis of the bronchiolar epithelium; the fibrinoid necrotic layer desquamates so that the bronchiole is denuded of epithelium. Also oedema of the peribronchiolar interstitial tissue is observed, with the presence of some mononuclear cells. Polynuclear infiltration is not regularly present. The reparative process is accompanied by proliferation of the epithelium of the terminal bronchioles; this produces a permanent collapse of parts of the lungs. The collapsed lung may be demonstrated by X-ray photography; it is often found that in surviving mice one lobe only is affected.

V. A lung filtrate from a case of human influenza was inoculated into a ferret by intranasal instillation under anaesthesia. The typical diphasic temperature reaction was shown, and areas of consolidation were observed in the lungs on the 6th day. The virus was transmitted to ferrets and mice by inoculation of extracts of the turbinates, lungs, and a lung extract of this ferret. In rabbits infected by intranasal instillation of material from mouse lung, the effects were less evident than in the other animals used. The virulence of the virus for g. pigs was increased during 12 successive passages.

In the monkey, no symptoms were seen for a fortnight after intranasal instillation; a gradual rise in the temperature then occurred and typical lung lesions were observed on the 30th day. Neutralization tests with human convalescent serum showed some degree of protection in mice.—E. C. Hulse.

Chaveiro Rebelo, C. P. (1936). Ensaios de diagnose da peste suina pelo método de Sarnowiec. [**Diagnosis of Swine Fever by Sarnowiec's Method**].—*Repos. Lab. Pat. vet., Lisboa.* **3.** 98-114. 7 tables. [English and French summaries].

The author used Sarnowiec's method on 28 experimentally infected pigs, 9 naturally infected pigs, 15 pigs inoculated with serum and 8 healthy pigs. He is unable to confirm Sarnowiec's work [*V. B.* **5.** 733.] in spite of the support given by Lange and Roger, since in his experiment none of Sarnowiec's postulates held; (1) there was no thermal reaction in any animal, (2) the date of death of diseased swine was not influenced by the injection of the formolized virus-oil mixture and, (3) six of the healthy swine died of S.F. and, therefore, not only is Sarnowiec's technique unreliable, but in S.F. free areas positively dangerous. [Presumably the author refers to a preparation in which live virus is present when used].—J. A. Pasfield.

Powick, W. C. (1937). **Distribution of Hog-Cholera Virus among Fractions of Virus Blood.**—*J. agric. Res.* **54.** 221-233. 6 tables. [8 refs.]

Blood from pigs infected with swine fever, was split into the following fractions:- erythrocytes, washed leucocytes, serum, haemolysate and stroma. Five experiments were carried out in order to compare the infectivity of these fractions, about three graded doses being used to find the minimum infective dose for each fraction, each dose being administered to one pig. The results were irregular and sometimes conflicting. The conclusions drawn confirm the view that the virus in S.F. is mainly associated with the cellular elements. The stroma of erythrocytes appears to hold a high concentration of the virus; very little is

attached to the leucocytes. Blood cells from a normal pig, when mixed with a serum containing virus, absorbed a considerable part of the virus from the serum.
—H. H. HOLMAN.

BORCILA, J., & ISOPESCU, I. (1937). L'existence en Roumanie de l'ecthyma contagieux du mouton. [**Contagious Ecthyma in Sheep in Rumania**].—*Arhiva vet.* **29.** 16-54. 10 figs., 1 table. [Numerous refs.] [In French].

The authors have encountered a disease in Rumania similar to contagious ecthyma. Studies of the causal agent showed that it could be filtered, was infectious to cattle, goats, dogs, cats, rabbits and man, and that resistance to reinfection for nine months occurred after artificial or natural infection. They consider that they were able to demonstrate viral bodies in the vesicular fluid and to maintain the organism in tissue culture for several generations.—P. S. WATTS.

SABIN, A. B., & OLITSKY, P. K. (1937). **Influence of Host Factors on Neuro-invasiveness of Vesicular Stomatitis Virus. I. Effect of Age on the Invasion of the Brain by Virus Instilled in the Nose. II. Effect of Age on the Invasion of the Peripheral and Central Nervous Systems by Virus Injected into the Leg Muscles or the Eye.**—*J. exp. Med.* **66.** 15-34 and 35-57. 2 figs., 15 tables. [8 refs.]

I. After intranasal instillation into mice the virus rapidly disappears. In two days it appears in abundance in the anterior part of the brain and the nasal mucosa of the young animals, but is difficult to demonstrate in older ones. In the latter, clinical symptoms are absent and the virus finally disappears. The failure of the virus to spread to the susceptible parts of the central nervous system cannot be explained by the hypothesis of a rapidly acquired tissue immunity in the infected mice as these can be killed by the further injection intracerebrally of minimal doses of virus. S. and O. suggest that the probable explanation is the presence of a pre-existing barrier in the fore brain.

II. Intramuscular and intra-ocular injections of virus rapidly kill young mice, but fail to give clinical symptoms in older animals. In the latter the virus remains localized at the site of injection and rapidly disappears. These older mice could be infected by direct injection of the virus into the sciatic nerve, approximately half the animals dying. The evidence is thought to support the conclusion that the spread of the virus is axonal in both the peripheral and the C.N.S. and that the resistance of older animals to other than intraneural injections is due to a " barrier " in the muscle or the myoneural junction.—P. S. WATTS.

FORTNER, J. (1937). La leucose des bovins. [**Bovine Leucosis**].—*Bull. Off. internat. Epiz.* **14.** 328-344. 2 figs.

Meat inspection statistics in Germany show a striking increase in the number of carcasses condemned on account of " tumours ", almost all such cases being in fact leucosis. In Saxony, during 1934, the incidence was approximately three times as high as in 1924. The only other country for which statistics are given is the U.S.A., where, during the years 1927-29 the incidence of leucosis in cattle was 0·01 %, which is about one third of that in Germany.

Bovine leucosis runs a very chronic course and the appearance of leucaemic changes in the blood represents an advanced stage of the disease. The blood picture is very variable and lymphocytosis may even be absent – the aleucaemic form of the disease.

Tuberculosis may be coexistent with leucosis – indeed both diseases may be found in the same organ.

The various theories as to the aetiology of leucaemia in man are discussed; the suggested causes include neoplasia or hyperplasia of the leucopoietic system, infection, endocrine imbalance and protein intoxication. There are two principal theories regarding bovine leucosis – causation due to a form of neoplasia (FELDMAN in U.S.A.), and to a filtrable virus (SCHÖTTLER [*V. B.* **5.** 87.], and DOBBERSTEIN and PIENING [*V. B.* **4.** 767.] in Germany).

In Germany, bovine leucosis is mainly confined to the country east of the Elbe. The sporadic appearance of the disease is against the view that it is infectious.

Various therapeutic measures have been uniformly ineffective in both man and animals.

German meat inspection regulations require the condemnation of the entire carcass if multiple lesions are found in the musculature; carcasses with isolated lesions need not be dealt with so drastically, although microscopical examination often shows lesions in organs which are apparently normal macroscopically.

—E. G. WHITE.

I. FEHÉR, T. (1937). Himlős istállójárvány csikók közt. [**Variola in Foals**].—*Állatorv. Lapok.* **60.** 77-78. 1 fig.

II. TÓTH, A. V. (1937). Megjegyzések dr. Fehér Tibor "Himlős istállójárvány csikók közt" cimu cikkéhez. [**Observations on the Article "Variola in Foals" by Fehér, T., in** *Állatorv. Lapok.* **60.** 77-78].—*Ibid.* 152-153.

I. F. describes a form of variola in foals considered to have been transmitted from children recently vaccinated against smallpox. The lesions were on the lips, nostrils and fetlocks, and there was fever. The condition could be transmitted from sick to healthy foals, but not to poultry.

II. T. reports that in several experiments he has succeeded in transmitting equine variola to fowls although he states that swine pox and fowl pox are distinct diseases and that no cross immunity exists between them. In practice it is important to differentiate equine pox from contagious pustular stomatitis.

—Z. DE CSUKÁS (MAGYARÓVÁR).

VELU, H. (1936). Saponine et excipients gras dans la diffusion du virus de la variole des porcelets. [**Saponin and Fatty Excipients in the Diffusion of Variola Virus in Piglets**].—*C. R. Soc. Biol. Paris.* **121.** 929-930. [6 refs.]

Six groups of piglets were inoculated (scarificn and subcut.) with glycerinated variola virus, saponified virus, or virus suspended in a fatty excipient. The piglets receiving glycerinated virus showed good local lesions with no generalization. In the other groups, neither saponin nor the fatty excipient had any localizing effect upon the virus after inoculation (subcut.).—E. C. HULSE.

HALLAUER, C. (1936). Immunitätsstudien bei Hühnerpest. III. Ueber aktive Immunisierung mit formalisiertem Virus. IV. Mitteilung. Ueber vererbte Immunität. [**Immunity in Fowl Plague. III. Active Immunization with Formalinized Virus. IV. Inherited Immunity**].—*Z. Hyg. InfektKr.* **117.** 711-721, and **118.** 605-614. 2 tables. [Numerous refs.] [See also *V. B.* **6.** 809].

III. The virus of fowl plague may be obtained in high concentration in the spleen and liver of infected birds. Such infected tissue is ground up with fluid to form a very fine suspension as free as possible from blood. To this suspension a maximum of 0·25% of formalin is added and the mixture is then stored at 4°C. Vaccine prepared in this way keeps a month. If administered subcutaneously or

intravenously in a dose of 0·5 c.c. it stimulates a powerful immunity which develops within six to ten days.

IV. Antibodies against fowl plague virus are to be found in the yolk of eggs laid by immune hens, the antibody titre of the yolk being roughly proportional to that of the blood of the hen. Embryonic tissue from eggs which contain much antibody is unsuitable for use in virus-tissue culture. Chicks hatched from eggs containing antibody have a natural passive immunity to the infection which disappears after about a month.—E. J. PULLINGER.

ANON. (1937). **Laboratory Diagnosis of Psittacosis.**—*Rep. publ. Hlth med. Subj., Lond.* No. 80. pp. 11. 12 figs. on 1 plate.

This report details laboratory technique for the detection of psittacosis in man, susceptible birds and mice. Stringent precautions in handling all infective materials are necessary and only specially equipped laboratories should undertake inoculation of suspect material.

The following material from birds for diagnosis is collected in Griffith's tubes :– all lung tissue, any portion of liver showing focal necrosis and the spleen, also the pericardial fluid and heart blood. Smears on two or three slides are made from each of these and stained either by Giemsa's stain or a modification of the Castañeda stain. (Tissue sections are best stained by Heidenhain's iron-haematoxylin). If smears are negative for virus particles measuring 0·25μ to 1μ in diam. the organs are ground up, pooled and suspended in sterile broth or tap water and 0·5 c.c. injected (intraperit.) into at least two mice. If very contaminated with bacteria the suspension is centrifuged or filtered through sand and paper pulp and another group of mice is inoculated. The mice are observed for one month, one of each pair being killed at the 10th day and an emulsion of its spleen injected into a fresh pair. If all survive, apart from deaths from intercurrent disease, the test is negative, but a further passage of mouse spleen is advised. All survivors should be tested by inoculation of virulent material. If all die the negative result is confirmed. If any survive this indicates that the original inoculum contained a quantity of psittacosis virus sufficient to produce an active immunity, but not sufficient to cause fatal infection. Bacteriological examination of birds is a necessary procedure to eliminate other possible causes of suspicious lesions or death.

Similar tissues and fluids, including any sputum and pleural fluid from suspected human cases are examined in the same way.

In mice three main types of disease occur according to the survival time after infection and these are detailed.

Ectromelia needs differentiation in mice, but the virus particles are acidophile whereas those of psittacosis are basophile.

Infected budgerigars have been found in this country in a few instances. It is suggested that, if proof of such infection be obtained, as many birds as possible be examined to detect the percentage of " carriers ". This percentage is said to vary according to the age of the birds.

The 12 figures illustrate the staining reactions of the virus particles.—C. V. W.

VON HAAM, E., & HARTWELL, R. (1936). **Experimental Conjunctivitis Caused by Virus of Lymphogranuloma inguinale.**—*J. trop. Med. (Hyg.).* **39.** 190-191. 2 figs. [5 refs.]

The intracerebral inoculation of mice, monkeys, ferrets, cats, sheep and calves with the virus of [human] *L.i.* gave rise to an acute haemorrhagic and purulent conjunctivitis three days to two weeks after inoculation, ferrets reacting most rapidly. Thus all these species of animals were susceptible to the virus. No

ulceration occurred. The lesion remained until the onset of death from meningo-encephalitis, but recovery was observed in a sheep and a calf.—J. E.

BAYON, H. P. (1936). **Transmissible Splenomegaly of Fowls or Reticulo-endothelial Leucosis ("Erythroleucosis").**—*Proc. R. Soc. Med.* **30.** 377-384. [Numerous refs.]

B. gives a brief review of the publications of other authors who have investigated the various haemopathies of fowls. He has found in 3-5% of fowls received for routine P.M. examination, a condition characterized by enlargement of the liver and spleen and accompanied sometimes by the presence of small tumours in the bowels and ovary. Histological examination showed that the condition was due to a diffuse proliferation of the reticulo-endothelial system of the liver, spleen and bone-marrow. The nerves were not affected. The condition could be transmitted provided that fresh material was inoculated into young fowls. Transmission experiments were also carried out with material obtained from JARMAI in Hungary who has described a transmissible "erythroleucosis" caused by a filtrable agent. B. considers that the condition described by him is the same as that described by JARMAI. He has found that, after treatment of the material with glycerol, only a fibrosarcoma without any leucosis is induced. It is suggested that the term "leucosis" should be reserved for those conditions in which the morbid condition consists in the primary proliferation of lymphoid cells (monoblasts or histiocytic cells) in the tissues, with their secondary invasion of the circulation as monocytes or blood histiocytes.—C. A. MCGAUGHEY.

PARASITES IN RELATION TO DISEASE (HELMINTHS).

RAO, M. A. N., & MUDALIAR, S. V. (1936). **Observations on the Treatment of Bovine Nasal Schistosomiasis.**—*Indian J. vet. Sci.* **6.** 332-345. [Num. refs.]

Experiments were made on 11 infected bullocks by treatment with antimony tartrate, "antimosan", and "trypaflavine". The bullocks were divided into three groups and increasing doses given in each case. Results were estimated by a count of the average number of ova in 0·1 c.c. of nasal discharge, and the experiments were designed to ascertain the minimum effective dose of each drug and the necessity for repetition, the progress of recovery as indicated by the ova count, and whether relapses occur.

The authors discuss the dosage of antimony tartrate and its dilution, and review previous work on the subject. In their own experiments a 6% solution was injected intravenously fairly rapidly, and no ill effects followed. The actual dose is more important than the dilution, and they confirm the findings of EDWARDS (1928) that the M.L.D. of antimony tartrate for Himalayan hill cattle is 14 c.c. of M-10 solution. In discussing elimination, however, it is stated that death may be caused if the same dose is repeated after a reaction has been obtained to the first dose, unless sufficient time has been given to allow of excretion of the drug from the system.

Tartar emetic is an effective and cheap drug. The dose recommended is 1½ grains per 100 lb. body weight repeated daily for six days, or 2½ grains every alternate day. "Antimosan" appeared to be safe and effective, but expensive. "Trypaflavine" was without useful effect.—S. J. GILBERT.

COUTELEN, F. (1936). Contrôle expérimental de certaines hypothèses récentes relatives au cycle évolutif du ténia échinocoque et à la prophylaxie de l'échinococcose. [**Development Cycle of** *Taenia echinococcus*. **Prevention of Echinococcosis**].—*Rev. Méd. Hyg. trop.* **28.** 161-178. [19 refs.]

C. has attempted to infect a number of species of birds with echinococcus but only succeeded in a rather doubtful infection of the turkey. Some original observations on secondary echinococcosis are also reported, but it is concluded that for practical purposes the association of the human being with the dog is the only cause of human echinococcosis, the horse, pig, sheep and ox acting almost exclusively as the reservoir intermediate hosts and the source of the dogs' infection. The reason for the prevalence of echinoccosis in certain countries is always the want of the proper control of dogs, and C. concludes by observing that the dictum "*cave canem*" represents the sole formula for the prophylaxis of echinococcosis.
—E. L. TAYLOR.

BARNETT, L. (1937). **Hydatid Disease. A Note on the Incidence in New Zealand for the year 1936.**—*N.Z. med. J.* **36.** 241-244.

The incidence of hydatid disease in human beings for 1936 in New Zealand was 133, while the number of deaths was 14.

Research activities in connexion with tapeworm control in dogs are being continued at the Medical School, Dunedin, while it is hoped by the author that there will be legal control of offal feeding to dogs.—C. S. M. HOPKIRK.

NEVER, E. (1936). Ueber die Brauchbarkeit der Komplementbindungsreaktion und Allergieprüfung zum Nachweis von Echinokokken bei Rindern und Schafen. [**Diagnosis of Echinococcosis in Cattle and Sheep by Complement-Fixation and Allergic Tests**].—*Inaug. Diss., Leipzig.* pp. 30. [Num. refs.]

Complement fixation is of definite diagnostic value in this condition in cattle and sheep. The results of tests on 50 cattle and 62 sheep were confirmed in every case when the animals were examined after slaughter. The number and size of echinococci have no effect on the c.f. reaction, as an animal with a single echinococcus the size of a hazel nut sometimes gave a stronger reaction than an animal with numerous and large echinococci. N. also maintains that there was no difference in the reaction whether the echinococci were fertile, sterile or calcified.

A strictly positive antiserum is essential for the success of the test.

Allergic reactions (subcut. and intracut. tests) were unreliable in cattle and sheep.—M. BURKE.

FOURIE, P. J. J. (1936). **A Contribution to the Study of the Pathology of Oesophagostomiasis in Sheep.**—*Onderstepoort J. vet. Sci.* **7.** 277-347. 65 figs., 3 tables, 3 graphs. [Numerous refs.]

The material for this study was obtained from lambs reared under worm-free conditions. These lambs were injected with large numbers of *Oesophagostomum columbrianum* larvae in the third stage and were killed at various periods from twelve hours onwards.

Primary parasitic migration takes place from 12 hours to 4 days after infection. During this period a primary eosinophilic reaction may take place in the mucosa, and lesions like those of the early stages of a haemorrhagic enteritis are sometimes observed. The muscularis mucosae seems to be a convenient mechanical obstruction to the penetration of the larvae. The cyst wall consists of a delicate membrane of undetermined nature. The larva is coiled in the cyst which contains some blood cells and a structureless material probably consisting of haemolysed blood cells. Two types of cysts were seen (1) those where little tissue reaction was evoked, and (2) those with well formed capsules. The secondary parasitic migration usually takes place five days after injection. The fourth stage larva now migrates either normally or abnormally. The muscularis mucosae is a mechanical obstruction

to its deeper penetration and the parasite goes towards the lumen of the intestine. A secondary eosinophilic reaction occurs and the eosinophiles may be found diffusely distributed throughout the mucous membrane. In the normal migration of the larvae nodules do not form in the intestinal wall.

An abnormal secondary parasitic migration may occur. For reasons not properly understood, the larvae penetrate the muscularis mucosae and then seem to lose all sense of direction. A marked eosinophilia occurs and nodules form. The larvae may produce marked destruction of normal tissues leading to a partial stenosis of the intestine or interrupted peristalis with invagination. The larvae may perforate the intestine and pass to the peritoneal cavity or even to organs such as the liver, where they die. A fatal peritonitis may occur in some cases.

Although the production of a toxin by the oesophagostome has not been proved there is strong circumstantial evidence for its existence.—E. M. Robinson.

IMMUNITY.

Wong, S. C. (1937). **The Relation Between the Growth of Mycobacterium Tuberculosis and the Yield of Tuberculin on Synthetic Media.**—*J. Bact.* **33.** 451-460. 5 tables. [12 refs.]

W. suggests that instead of assessing the value of a synthetic medium for the preparation of tuberculin on the basis of amount of growth per unit volume, the ideal medium should be defined as one which will yield the greatest amount of tuberculin per unit volume of medium in the shortest possible time and at the lowest cost. He has devised a glucose-sucrose medium from which he has obtained about three times the amount of tuberculin produced from Long's synthetic medium at about one third of the cost. The development of a final alkaline pH was found to be an important factor in the production of tuberculin, which apparently is not directly related to amount of growth per unit volume, but rather to the rate of autolysis of bacteria. Details are given of the formula and method of making the medium.—C. A. McGaughey.

I. Saenz, A. (1937). Degré d'allergie conféré au cobaye par l'inoculation de bacilles tuberculeux morts enrobés dans des excipients gras d'origine végétale ou animale. [**Degree of Allergy conferred on the G. Pig by the Inoculation of Dead Tubercle Bacilli Coated in Fatty Excipients of Vegetable or Animal Origin**].—*C. R. Soc. Biol. Paris.* **124.** 338-340. [4 refs.]

II. Saenz, A. (1937). Caractères des réactions allergiques determinées par des bacilles morts isolés de cobayes neufs et enrobés dans l'huile de vaseline. [**Characters of the Allergic Reactions Caused by Vaseline-Coated Antigen Prepared from Dead Acid-Fast Bacilli Isolated from Inoculated G. Pigs**]. —*Ibid.* 887-889. [5 refs.]

I. Having found that the suspension of dead tubercle bacilli in vaseline gave rise to a more marked reaction when the animals were subsequently tested with tuberculin intradermally than when they were inoculated with live virulent bacilli suspended in saline, S. has tried other "fatty" excipients. Lanoline and the yolk of eggs were found to have no effect; vegetable oils gave rise to reactions similar in degree to those caused by live virulent bacilli.

II. S. has isolated from g. pigs acid-fast bacilli differing from avian tubercle bacilli in their cultural characteristics and virulence. The colonies are smooth in appearance, and nodular lesions cannot be produced in the rabbit or the fowl.

It was found that these organisms suspended in vaseline and injected gave

rise to an increased tuberculin reaction both to homologous and mammalian tuberculin. This reaction was twice as great as that with avian tuberculin. Similar results were obtained when Koch's phenomenon was utilized for test purposes.—
D. L. HUGHES.

CANIĆ, R. J. (1936). Uporedba diagnostičke vrijednosti aglutinacije, vezivanja komplemenata i Meinickeove reakcije kod bruceloza. [**Diagnosis of Brucellosis by the Agglutination, Complement-Fixation and Meinicke Reactions**]. —*Jugoslov. vet. Glasn.* **16.** 603-611. 4 tables. [Numerous refs.] [German summary]. [Also appeared as *Inaug. Diss., Zagreb.* pp. 54].

C. applied the agglutination, complement-fixation and Meinicke reactions for brucella infection to the blood sera of 206 cattle, 170 pigs and 71 laboratory animals, some of which were affected with brucellosis. A high degree of accuracy was obtained with all three.

I. FREI. (1937). Standardisation des méthodes d'agglutination et fixation d'un titre unique d'agglutination dans le diagnostic des brucelloses animales. [**Standardization of the Agglutination Test for Brucellosis**].—*Bull. Off. internat. Epiz.* **14.** 20-61. Discussion pp. 390-409. Resolution p. 479. 6 tables. [Numerous refs.]

II. WILLEMS, R. (1937). Sur la standardisation des méthodes d'agglutination dans le diagnostic des brucelloses animales. [**Standardization of the Agglutination Test for Brucellosis**].—*Ibid.* 62-87. Discussion pp. 390-409. Resolution p. 479. 4 tables. [11 refs.]

I. As a result of a report submitted to the 1936 meeting of the Committee of the Office International des Épizooties [*V.B.* **7.** 184.], showing the differences which existed in the test suspensions, methods of testing and diagnostic criteria employed in different laboratories for the diagnosis of bovine contagious abortion by the aggl. test, STABLEFORTH, WILLEMS and FREI were invited to report on the matter to the 1937 meeting.

F. advocates standardization of methods, suspensions and diagnostic criteria on an international basis, but inclines to the view that test suspensions could be prepared centrally in each country and distributed from these centres. The agglutinability of the suspension issued by the station concerned in each country would be kept constant by the use in each of an international dried serum standard. He discusses the method of keeping blood samples if they cannot be tested at once, the preparation of culture media and suspension, the density of suspension, age when used, actual method of putting up tests, duration of incubation and diagnostic criteria.

The culture should be grown 1-3 days, suspended in 0·5% phenol or 0·2% tricresol, heating then being unnecessary. He believes that the suspension should be fairly thin and should not contain more than 0·25-0·5 parts per 1,000 of bacterial bodies. Suspensions should be standardized from time to time by means of a dried serum. Dilutions should be prepared in saline and an equal volume of suspension then added. They should be incubated for two days.

He apparently agrees with the view of GRÄUB [personal communication] that, when using a suspension which contains 0·7-0·8 parts per 1,000 by volume of bacterial bodies, a reaction at somewhere between 1 : 10 and 1 : 30 should be regarded as positive. He believes, however, that, if some standardization of suspension and method could be realized, more definite criteria could soon be agreed upon by comparing the results obtained in various countries.

II. The conclusions drawn from his investigations by W. may be briefly

summarized as follows. Arrangements should be made by the Office for the availability of a standard dried serum. A basal suspension should then be selected and titrated exactly with the standard serum. The highest dilution at which 50% agglutination occurs should be called its " index of agglutinability ". Agreement should also be reached on the titre to be accepted as positive for purposes of diagnosis with the basal suspension. The figure obtained by dividing this titre by the " index of agglutinability " of the basal suspension should be called the " agglutination constant ". Other suspensions would then be titrated with the standard serum to determine their " index of agglutinability " and this figure multiplied by the " agglutination constant " would give the diagnostic titre appropriate to the suspension concerned. It is suggested that the dried serum described by STABLEFORTH [*V. B.* **7.** 184.] should be accepted provisionally as the standard, that the basal suspension should have an " index of agglutinability " of 700 and that, with this suspension 50% agglutination at 1 : 50 should be accepted as positive for diagnostic purposes. The " agglutination constant " would thus be $500 \div 700 = 0{\cdot}07142$.

Arrangements are outlined for the preparation of national serum standards of the same value as the international standard, and for the determination of the " index of agglutinability " of test suspension by one or if necessary more laboratories in each country. It is suggested that suspensions should be prepared on agar, washed off in 0·5% carbol-saline and heated for an hour at 60°C. The suspension should be kept in the dark at 5°-10°C. and titrated from time to time. Sera for test should not be heated ; dilutions should be made in carbol-saline and 1 c.c. of suspension then added, four tubes being used, the third of which contains serum at a dilution which, if positive, will be regarded as an indication of infection. The tests should be incubated at 37°C. for 24 hours. Details are given of the suggested method of reading ; the result of each test should be characterized by a fraction having, as a numerator, a titre, that is to say a tube, in which 50% agglutination occurs, and as a denominator, the " index of agglutinability " of the particular suspension used.

It is suggested finally that, having determined the " agglutination constant " with a standard serum, certain laboratories should exchange and examine a number of sera and report their results to a committee of the Office, which would consider permanent adoption of the method set forth. A resolution to this effect was passed by the Committee.—A. W. STABLEFORTH.

I. HEIDELBERGER, M., & KABAT, E. A. (1936). **Chemical Studies in Bacterial Agglutination. III. A Quantitative Theory of Bacterial Agglutination.**—*Proc. Soc. exp. Biol., N.Y.* **35.** 301-303. 1 table. [7 refs.]

II. HEIDELBERGER, M., & KABAT, E. A. (1937). **Chemical Studies on Bacterial Agglutination. III. A Reaction Mechanism and a Quantitative Theory.**—*J. exp. Med.* **65.** 885-902. 1 fig., 7 tables. [Numerous refs.] [See also *V. B.* **6.** 820] [A further note of I].

III. JORDAN, E. O. (1937). **Normal Bacterial Agglutinins and their Significance.**—*J. infect. Dis.* **61.** 79-87. Numerous tables. [14 refs.]

I & II. Working with pneumococci, a technique for carrying out the agglutination test with a minimum number of variable factors has been evolved. Using this technique, it has been shown by quantitative methods that bacterial agglutination is subject to similar laws of mass action to those which govern the precipitin test. In formulating equations which express the process of agglutination, allowance has, of course, to be made for the fact that all the reaction must occur on the surface of the bacterium. The role of the electrolyte in bacterial agglutination

is discussed and the hypothesis is advanced that the electrolyte acts by minimizing electrostatic effects due to the presence of many ionized groupings in the clumps of bacteria which are forming. Such electrostatic effects result indirectly in an increase of viscosity which might prevent the continuation of chemical reactions.

III. A study of the " normal agglutinins " found in the blood of various animals. J. confirms the well-known fact that many species of animal (cattle, horses and monkeys in particular) have in their blood specific antibodies against organisms non-pathogenic for the animals in question. The titres of these " normal antibodies " tend to be higher in old animals. No discussion of the nature or origin of such antibodies is given.—E. J. PULLINGER.

I. D'ANTONA, D., & VALENSIN, M. (1937). Supériorité de l'immunité antitétanique active sur l'immunité passive. [**Superiority of Active over Passive Immunity to Tetanus**].—*Rev. Immunol.* **3.** 437-443. 3 tables. [1 ref.]

II. SACQUEPÉE, E., & JUDE, A. (1937). Sur l'immunité conférée par le sérum antitétanique. [**Immunity Conferred by Tetanus Antiserum**].—*Ibid.* 444-448. 1 table. [12 refs.]

III. SNEATH, P. A. T., KERSLAKE, E. G., & SCRUBY, F. (1937). **Tetanus Immunity : The Resistance of Guinea Pigs to Lethal Spore Doses Induced by Active and Passive Immunization.**—*Amer. J. Hyg.* **25.** 464-476. 6 tables. [8 refs.]

I. A report of experiments on g. pigs showing that formolized tetanus toxoid injected 5-24 hours before artificial inoculation (subcut.) of virulent toxin gave complete protection, whereas a similar dose of toxin followed 24 hours later by a protective dose of antitoxin usually produced lethal tetanus. These results emphasize the superiority of active over passive treatment. [The duration of effective active immunization was not ascertained].

II. Judged by the Ramon technique, tetanus antitoxin remains in the blood for a considerable time after passive immunization. For about two weeks after immunization with 3,000 units of antitoxin, 1/10th of a unit per c.c. of serum was still demonstrable, whilst after as long as 47 days between 1/100th and 1/500th of a unit of antitoxin per c.c. still remained. The rate of disappearance of antitoxin from the blood varied with individuals.

III. The number of tetanus spores, injected (subcut.) with $CaCl_2$ activator, necessary to produce lethal tetanus in g. pigs was ascertained. Using this as the standard lethal spore dose, it was shown that g. pigs actively immunized with toxoid are better protected against subsequent artificial infection with a lethal spore dose than are animals similarly infected and subsequently protected with a single dose of antitoxin (passive protection).—E. J. PULLINGER.

ANDO, K., KEE, R., & MANAKO, K. (1937). **Studies on Serum Fractions. II. Differences in the Antigenic Structure of Different Horse Sera.**—*J. Immunol.* **32.** 83-96. 8 tables. [7 refs.]

Considerable difference was found in the antigenic structure of normal, antitoxic and antibacterial horse sera. The antisera reacting with these horse sera were prepared by the injection of diphtheria toxoid-antitoxin floccules and the specific precipitate of pneumococcal S.S.S.

The original article should be consulted for the actual experimental details.
—D. L. HUGHES.

GORDON, J. (1937). **The Opsonic Action of Serum.**—*J. Immunol.* **32.** 375-378. [5 refs.]

It was shown that staphylococci can take up, from ammonia-treated serum, an opsonin which is not removed by thorough washing. This opsonin is not defective complement similar to that which can be rendered complete by the addition of "fourth complement" supplied by leucocytes.—H. E. BYWATER.

HEIDELBERGER, M., & PEDERSEN, K. O. (1937). **The Molecular Weight of Antibodies.**—*J. exp. Med.* **65.** 393-414. 3 figs., 3 tables. [Numerous refs.] [Copied *verbatim* from *Bull. Hyg., Lond.* **12.** 540. Signed W. W. C. TOPLEY].

In this paper the authors record an interesting and important series of observations on the molecular weight of antibodies developed in the rabbit and the horse, as determined by sedimentation in the ultracentrifuge.

It was found that the sedimentation constant of the principal globulin component of normal rabbit serum, of isolated normal rabbit globulin, of the anti-egg albumin antibody in the serum of immunized rabbits, of the isolated immune globulin from such antisera, and of purified Type III antipneumococcus antibody prepared in the rabbit, varied between $6{\cdot}6 \times 10^{-13}$ and $7{\cdot}4 \times 10^{-13}$, with a mean value of $7{\cdot}1 \times 10^{-13}$, which is very close to the value determined by SVEDBERG and his colleagues at Upsala for the principal globulin component of other normal mammalian sera. It would appear, therefore, that the rabbit produces an antibody conforming in molecular size to the main globulin component of normal rabbit serum, and with a molecular weight of approximately 150,000.

The sedimentation constant of the main component of normal horse globulin does not differ significantly from that of the main component of normal rabbit globulin. But Type I antipneumococcus antibody prepared in the horse, whether studied as present in the untreated immune serum, or as a chemically purified antibody solution, or after dissociation from the specific antigen-antibody compound, has a sedimentation constant of about $18{\cdot}4 \times 10^{-13}$. Assuming that the difference in value is not greatly affected by possible differences in molecular shape, this would indicate a molecular weight of the order of 500,000, about 3-4 times greater than that of the main globulin constituent. It should be noted that a small globulin fraction having a sedimentation constant of this order occurs in normal horse serum, and in normal rabbit serum.

It would appear, therefore, so far at least as these particular antibodies are concerned, that the horse differs from the rabbit by producing specific antibody globulins that correspond, in molecular size, not with the main globulin component of normal mammalian serum, but with a component that is normally present in relatively small amount.

It is an obvious possibility that the many differences in immunological behaviour between horse and rabbit antisera, acting on the same antigens, may be referable to this difference in molecular weight; and the question is clearly raised as to whether the horse is the best animal for the preparation of therapeutic antisera for use in man.

BRANDES, W. W., & CAIRNS, A. B. (1937). **The Effect of Experimental Acidosis on the Production of Immune Bodies in the Rabbit.**—*J. Immunol.* **32.** 137-141. 1 table. [8 refs.]

Acidosis was produced in rabbits by the daily intravenous injection of from 1 to 25 c.c. of a 12% solution of ammonium chloride. The degree of acidosis was measured by the CO_2 combining power of the plasma.

Such rabbits, when injected with a suspension of *Salmonella typhi* and ovalbumin, either separately or combined, developed agglutinins and precipitins in much smaller titre than controls.—H. E. Bywater.

Morgan, W. T. J. (1937). **A Conception of Immunological Specificity.**—*J. Hyg., Camb.* **37.** 372-383. [Numerous refs.]

M. has reviewed the literature on the above subject in order to develop an hypothesis on the relationship that exists between an antigen and its antibody.

It is now known that chemical structure is important in determining the specificity of both natural and synthetic antigens. Antigens have been prepared artificially and the serologically important part of the antigenic complex may be determined. It has been possible to determine the influence which a definite chemical structure has on the specificity of an antibody by adding it to, or withdrawing it from, an antigen. In some instances, small differences in the chemical structure of an antigen are reflected in the specificity of the corresponding antibody. On the other hand, serological cross-reactions may occur between antigens, and the antibodies engendered by antigens similarly but not identically constituted. For example, the pure specific polysaccharide of *Bact. shigae* combines with the homologous agglutinins and precipitins and also neutralizes the heterophile antibody. [The heterophile antibody is a haemolysin due to the stimulus of a so-called heterogenetic antigen which is present in various animal tissues and in certain bacteria including *Bact. shigae*]. As these are independent reactions the view is expressed that this single polysaccharide contains within its molecule two reactive and immunologically distinct structures.

The hypothesis put forward is that groups of different specificity can exist in a single molecule of an antigenic substance and that each group can stimulate the formation of a corresponding antibody. [The conception is that a single antigenic molecule may actually contain several antigenic factors some of which predominate over others. These factors can each stimulate the formation of corresponding parts in the antibody molecule produced where antibody factor will be formed in response to the predominant antigenic factor. These antibody factors are spoken of as receptors]. If the antigenic structures of an antigen are designated A, B and C, and are arranged in order of their capacity to stimulate specific receptors on the antibody molecule, A being the dominant determinant, the three main types of antibody will be produced as follows :– a, ab and abc. Early in the immunization process, antibody molecules will contain receptors for the most active antigenic structures only, whereas prolonged immunization will engender antibody molecules which possess receptors for all of the antigenic structures of the antigen. The less active antigenic structures may occur in other antigen molecules and thus give rise to cross reactions. It is the number, the nature, and the position of the determinant antigenic structures of an antigen that is important, and the nature and molecular configuration of the antigenic molecule as a whole which determines the complete immunological specificity of the homologous antibody molecules. This is an alternative explanation to the one generally accepted according to which bacteria, that are capable of inducing the formation of more than one antibody, do so in virtue of several separate intracellular antigens corresponding to the antibodies formed.—R. Lovell.

DISEASES, GENERAL.

—. (1937). **Veterinary Medicine.** [Special Issue of Sheep Diseases]. **32.** 248-300. Numerous figs. [Numerous refs.]

This issue contains 17 original articles by American practitioners residing in

sheep-raising areas, and numerous abstracts and topical notes from various sources on diseases and other points of interest in sheep. An outline is given of the population and diseases of sheep in each state, which, in conjunction with the whole issue, makes it very useful for reference purposes.—J. E.

DESCAZEAUX, J. (1937). De l'élevage du mouton et de certaines maladies des animaux au Chili. [**Sheep Diseases in Chile**].—*Bull. Soc. Path. exot.* **30.** 443-447.

The Romney Marsh and Corriedale breeds withstand the rigorous climate well and the only diseases of importance are caseous lymphadenitis, mange and *Cysticercus tenuicollis* infestation.—P. S. WATTS.

OPPERMANN, T. (1937). Praktische Winke für die Diagnose und Bekämpfung der wichtigsten Schafkrankheiten. (Magenwurmseuche). [**Diagnosis of Sheep Diseases. "Stomach Worm Epidemic"**].—*Tierärztl. Rdsch.* **43.** 399-401. 1 table. [Numerous refs.]

Haemonchus contortus infestation is described. In some flocks in Germany 80% of the sheep have died. O. reports successful treatment, after 2-3 days fast, with lentin, which was repeated after an interval of 3-4 weeks.—G. H. (VIENNA).

GRIEDER, H. (1936). Die häufigsten und wichtigsten Kaninchen-Krankheiten in der Schweiz. [**Common Rabbit Diseases in Switzerland**].—*Tierwelt Zofingen.* **46.** 743-745. [Abst. from reprint].

The following diseases were diagnosed in 561 dead rabbits sent to G. for P.M. diagnosis :– coccidiosis, haemorrhagic septicaemia, gastro-enteritis due to dietetic errors, diplococcal septicaemia, pseudotuberculosis, cysticercosis and tuberculosis, in that order of frequency.

Most of the article is devoted to a description of the common diseases of rabbits.

RAJAGOPALAN, V. R. (1936). **Some Diseases of Poultry in India with Notes on Prevention and Treatment.**—*Agric. Live-Stk India.* **6.** 662-666.

This article describes some of the notable contagious diseases of poultry in India. R. describes the methods available for their control and treatment. Poultry disease investigations in India are stated to be in their infancy and R. stresses the importance of obtaining the aid of veterinary services whenever contagious diseases of poultry are suspected.—K. D. DOWNHAM.

I. BABIĆ, I. (1936). Ugovorne mane peradi. [**Redhibitory Poultry Diseases in Yugoslavia**].—*Jugoslov. vet. Glasn.* **16.** 256-258. [9 refs.]

II. BABIĆ, I. (1936). Ugovorne mane pasa. [**Redhibitory Diseases of Dogs in Yugoslavia**].—*Ibid.* 311-312. [4 refs.]

I. No redhibitory poultry diseases are mentioned in the Yugoslavian code. The following could be considered to be of importance in this respect :– fowl cholera, fowl typhoid, fowl pox, spirochaetosis and coccidiosis. A short description of each disease is given.

II. No redhibitory diseases of dogs are contained in the Yugoslavian code. Distemper and mange and certain defects in hunting dogs may give rise to lawsuits.

Short descriptions of these diseases and of some defects in dogs are given.
—B. OSWALD (SPLIT).

ANON. (1936). Raza de Ganado Blanco Orejinegro. [**The White Orejinegro Breed of Cattle in Colombia**].—*Rev. Med. vet., Bogotá.* **7.** 61-85. 8 figs.

A general description of the White Orejinegro breed of cattle of Colombia.

With regard to disease susceptibility it is said that the breed is relatively resistant to myiasis due to *Dermatobia*.—S. Torres.

van Saceghem, R. (1937). L'étiologie des maladies infectieuses d'après une conception nouvelle. [**A New Theory for Infectious Diseases**].—*Rev. Path. comp.* **37.** 355-372.

A philosophical discourse upon the nature of infection and resistance which does not lend itself to abstraction. The underlying theme is that of "*Mens sana in corpore sano*", *i.e.* that disease is the outcome of psychological disharmony. Applying this conception to practical considerations it is contended that the ideal type of hygiene consists of placing the individual under as nearly natural conditions as is possible whilst keeping all faculties in complete harmony. Hygienic measures (in the form generally recognized) would automatically come into action under such conditions and would exert their undeniably beneficial effects.—E. J. P.

Spink, W. W. (1936). **Observations on the Kurloff Bodies in the Blood of Guinea Pigs.**—*Proc. Soc. exp. Biol., N.Y.* **35.** 5-6. [4 refs.]

The author confirms that there is a proportional relationship between eosinophilia and the number of Kurloff bodies. He notes that this is not absolute, but depends on the level of monocytes in the blood.—P. S. Watts.

Gardiner-Hill, H. (1937). **Abnormalities of Growth and Development. The Clinical and Pathological Aspects.**—*Brit. med. J.* June 19th. 1241-1248 and June 26th. 1302-1308. [Numerous refs.]

These articles formed the subject matter of the Oliver-Sharpey Lectures, delivered before the Royal College of Physicians of London in March, 1937. An exhaustive account of normal and pathological growth and development in the human subject is illustrated by numerous case records.

Growth and development are influenced by the interaction of four groups of factors, nutritional, infective, endocrine and hereditary. These factors produce alterations in bodily size on the one hand, and variations in the time factor of development on the other.

Little is known of the influence on growth and development of over-nutrition and hypervitaminosis: the effects of under-nutrition, hypovitaminosis and infective disease are becoming more clearly defined.

Our knowledge of the influence of hormones has increased enormously during the last decade and of special importance are the anterior pituitary growth hormone and the sex hormones. The part played by heredity is clearly an important one, but did not come within the scope of these lectures.

It is of interest that, in man, there appear to be three growth cycles: rapid growth during the first year is followed by a slower period until the second peak between the fifth and seventh years (second dentition), and, after a period of slow growth until the eleventh or the twelfth years (variation due to sex) there occurs the third peak at puberty. The normal curve may be considerably modified by abnormalities of diet, environment, or disease.—E. G. White.

Schäper, W. (1935). Ueber todbringende Erbanlagen (Letalfaktoren) in der Schweinezucht. [**Inherited Lethal Factors in Swine**].—*Z. Schweinez.* pp. 723-727. [Abst. from abst. in *Jber. Vet.-Med.* **59.** 359].

S. describes the types of lethal factor concerned in inherited disease of domestic animals and reviews the literature on recessive lethal factors in swine, such as are common in the pedigree breeds in Germany. Examples include malformations

of various kinds, impaired fertility, death of piglets *in utero* or soon after birth, paralytic conditions, atresia ani, muscle contractures, thick forelegs, hernia, hairlessness, etc. Control measures are outlined.

DARRASPEN, E., & LABATUT, R. (1936). La congestion cérébrale des solipèdes en Provence. [**Cerebral Congestion of Horses in Provence**].—*Rev. vét., Toulouse.* **88.** 601-607.

This is an account of a peculiar non-specific form of cerebral congestion met with in horses in Provence, France. The authors state that the disease appears in association with overfeeding, labour in the heat of the day and forms of work requiring the animal to circle constantly, as when in attachment to grain crushing machinery. Symptoms and treatment are described. Onset is marked by a period of excitement, followed by one of somnolence with cranial hyperpyrexia, a normal body temperature and intense congestion of the conjunctival mucous membrane. Such are pathognomonic. The brain is the essential centre of affection and disorder. Cold douches to the head, prompt bleeding and the injection of pilocarpine nitrate are indicated for the relief of the condition.—C. DAVENPORT.

GUOTH, G. E. (1937). Acropachia lóban. [**Acropachia in the Horse**].—*Állatorv. Lapok.* **60.** 167-172. 5 figs. [9 refs.]

Two cases of acropachia – in a three-year-old and a four-year-old horse respectively – are described, diagnosis being confirmed by histological work. In one horse there was concurrent urticaria and, in the other, ulcerative rhinitis. Acropachia has a tendency to regress spontaneously. The condition did not affect the health of the horses.—Z. DE CSUKÁS (MAGYARÓVÁR).

SCHÄPER, W. (1937). Konstitutionelle Hauterkrankungen beim Pferd. [**Constitutional Skin Diseases in Horses**].—*Z. Zücht. B.* **37.** 295-330. 3 figs. [Numerous refs.]

Whilst the inheritance of skin diseases has been for long recognized in human beings this has not been so in veterinary medicine.

S. reports that skin diseases such as grease, have been observed in Rhineland and Westphalia in stallions kept even under the most favourable conditions, and that they were very resistant to treatment. It was also found out that the affected horses were the progeny of a stallion imported from Belgium. It was concluded that conditions were inherited and that affected horses should not be used for breeding. —F. FREUDENBERG (BERLIN).

KNAPP, F. E. (1936). Zur Frage des chloromatösen Myeloms beim Schwein. [**Chloroma-Myeloma in the Pig**].—*Inaug. Diss., Hanover.* pp. 28. 4 figs. [Numerous refs.]

In the bone-marrow of the ribs and thoracic vertebrae and one femur of a slaughtered pig, green discoloration was found. On histological examination the changes were identified as chloroma, which is a rarity in animals. It is said that only nine cases have been described.—F. FREUDENBERG (BERLIN).

SELLIER, L. (1936). Anomalies des organes génitaux des génisses jumelles de mâles. [**Anomalies of the Genital Organs of Freemartins**].—*Thesis, Lyons.* pp. 50. [Numerous refs.]

A general discussion on the nature of freemartins and a short description of one case in a 10-month old bovine of the Salers breed. The animal was twin with a normal bull and was a pseudo-hermaphrodite, possessing rudimentary testicles in the inguinal region and a small vulva but no vagina.—J. E.

I. Caslick, E. A. (1937). **The Vulva and the Vulvo-Vaginal Orifice and its Relation to Genital Health of the Thoroughbred Mare.**—*Cornell Vet.* **27.** 178-187. [3 refs.]

II. Caslick, E. A. (1937). **The Sexual Cycle and its Relation to Ovulation with Breeding Records of the Thoroughbred Mare.**—*Ibid.* 187-206. 1 fig., 3 tables.

I. The author describes a habit of mares whereby air and foreign material is aspirated into the vagina and uterus. He terms it " wind sucking ", and regards it as being due to a failure of the vulva or vulvo-vaginal constrictor muscles. Predisposing factors in parturient mares are disease of the foetal membranes, over-stretching of the constrictor vulvae muscle followed by semi-paralysis, and the proximity of the first oestrual period. The condition follows injury to the vulva and rectum, and it occurs after abortion or dystokia. Symptoms and pathological changes are described. Cures are reported as a result of suturing or clamping the upper halves of the labiae vulvae together.

II. During a period of 5 years C. has recorded the phases of the sexual cycle in 1,200 thoroughbred mares as noted by vaginal examination, and has studied the breeding records of 683 foaling mares and 306 maiden and barren mares.

Four clinical types of cycle in the barren mare are described, namely (1) long oestrus, (2) long di-oestrus, (3) irregular oestruation, and (4) absence of oestrus; and the breeding history of typical mares in each group, except the last, is given.

He is opposed to the practice of puncturing ovarian cysts, for he regards these as an attempt on the part of the individual to balance the endocrine system or some antagonism between this system and the nervous system. He suggests that the correct treatment of ovarian troubles appears to lie in a proper understanding of the variations in the sexual rhythm and the external vigilance of those associated with breeding.—H. V. Hughes.

László, F. (1936). Adatok a szarvasmarha endometriumának kórszövettanához. [**Histology of Endometritis in Cattle**].—*Állatorv. Lapok.* **59.** 207-208.

In an examination of the uteri of 300 slaughtered cows, pigmented spots were seen on the endometrium of 1·6% (evidently the traces of oestral bleeding), chronic metritis in 3%, chronic purulent metritis in 3% and tuberculous metritis in 3·6%.—Z. de Csukás (Magyaróvár).

Quinlan, J., & Roux, L. L. (1936). **Researches into Sterility of Cows in South Africa. The Influence of : (1) Dry Rations, (2) Lack of Exercise, and (3) Lack of Sunlight on Reproduction in Beef Heifers and Cows.**—*Onderstepoort J. vet. Sci.* **6.** 719-772. 44 figs., 14 tables, 2 appendixes. [Num. refs.]

Beef heifers were kept for a period of six years under conditions of restricted exercise and light and fed on dry rations. For three months of the year there was an addition of maize ensilage to the ration. The rations consisted of maize, wheaten bran and teff hay. Satisfactory growth and maintenance were produced in adult animals. Sexual maturity was reached before the age of 24 months. Up to the end of the 4th gestation period sexual activity and reproduction were not impaired.

Restricted sunlight was not detrimental to the health and vigour of the animals and sexual activity was not interfered with. 75% of the cattle had di-oestral cycles falling between 18 and 23 days but some cycles were as short as 10 or as long as 123 days.

Restriction of sunlight and exercise appeared to shorten rather than lengthen the period between calving and the first subsequent oestrus. As a rule it was

about 60 days but in some cases it was as short as 15 to 21 days. Periods as long as 100-200 days were observed, but there was a tendency for them to shorten when the cows were between 3 and 6 years old. With unrestricted sunlight and exercise fewer services were required to establish pregnancy and also fewer services were required as the age advanced. In young animals failure to conceive after the first and second services was occasionally noted. Restriction of sunlight and exercise did not affect the duration of the gestation period. The weights of the calves produced was not affected by restricted sunlight and exercise, but a change of bulls greatly affected the weight of the calves. The enforced environmental conditions did not produce abnormal sexual activity when breeding was delayed until the heifers were 35 months old.

Cows which maintained a high condition during the periods of gestation, lactation and rest showed a tendency to produce calves which were small and light in comparison with heifers which did not retain such high condition.
—E. M. Robinson.

Cunningham, I. J., Hopkirk, C. S. M., & Cunningham, Marion M. (1937). **Further Evidence of the Relation of Dietary Protein to Sterility.**—*N.Z. J. Sci. Tech.* **19.** 22-30. 3 tables. [1 ref.]

Male rats fed on a diet composed largely of maize as a source of protein, but containing all other necessary food factors, are known to become sterile. Substituting maize with rye, wheat or barley prevents sterility. Further supplements such as bull testes, dried salmon testes, dried yeast, and marmite alone or in combination were tried as substitutes for maize. Testes fed in sufficient quantity were found to prevent sterility and the suggestion is made that possibly one of the amino-acids such as arginine may be the limiting factor. It seems certain that the quality of the protein is of prime importance to the development and proper functioning of the testes of the rat.—C. S. M. Hopkirk.

Hart, G. H., & Miller, R. F. (1937). **Relation of Certain Dietary Essentials to Fertility in Sheep.**—*J. agric. Res.* **55.** 47-58. 9 tables. [4 refs.]

If young ewes are fed consistently on a vitamin A deficient diet until night blindness occurs the majority conceive normally, but the lambs are either born dead or die within 24 hours. A diet low in protein has but little deleterious influence on the sheep, but if the phosphorus content is insufficient the animals waste considerably.—P. S. Watts.

I. Deiters, E. F. (1936). Ueber den Cholesteringehalt des Blutes gesunder und kranker Pferde. [**Cholesterin Content of the Blood of Healthy and Sick Horses**].—*Inaug. Diss., Hanover.* pp. 38. 9 tables. [Numerous refs.]

II. Meyer, J. (1937). Untersuchungen über den Chlorgehalt des Blutes bei gesunden und sporadisch kranken, insbesondere mit Kolik behafteten Pferden. [**Chlorine Content of the Blood of Sick Horses**].—*Inaug. Diss., Hanover.* pp. 44. 2 tables. [Numerous refs.]

I. The colorimetric method of Autenreith and Funk was used to estimate the cholesterin content of the blood of healthy and sick horses. In healthy horses the value was found to be 90-140 mg. in 100 c.c. of blood. Breed, sex and age had no influence.

After 10-15 minutes sharp exercise the cholesterin content was found to rise by an average of 13·3 mg.%. In internal diseases connected with fever and in chronic diseases there was an increase in the cholesterin content, but in colic and surgical diseases there was no change from normal.

II. M. found that the chlorine content of the blood of healthy horses remains fairly constant between 2·7 and 2·9 mg. per 100 c.c. In conditions associated with anaemia and oedema the chlorine content rises, and in cases of severe obstructive colic it falls.—F. Freudenberg (Berlin).

Inántsy, E. (1937). Skorbut kutyában. [**Scurvy in the Dog**].—*Állatorv. Lapok.* **60.** 174-175.

Two cases of illness in dogs were diagnosed as scurvy brought about by a diet consisting exclusively of cooked foodstuffs.

In both dogs there was salivation, ulceration of the gums and loose teeth; there were petechiae on the skin of the abdomen and blood was present in the faeces.—Z. de Csukás (Magyaróvár).

Piazza, C. (1937). El bocio endémico. [**Endemic Goitre in Argentina**].—*Rev. Med. vet., B. Aires.* **19.** 97-122. 8 text figs., 2 figs. on 1 plate, 6 tables. [5 refs.]

P. observed 391 cases of goitre in 4,743 sheep from Vallarino, Pehaujó and Patagones; in one flock, 60% of the lambs were affected. In the "goitrous" regions the percentage of iodine in the thyroid gland of normal lambs varied from 0·17% to 0·25%, and in diseased lambs from 0·111% to 0·215%.

The aetiology is discussed with reference to the geology of the region, iodine deficiency, and infections, and the relation between goitre and American trypanosomiasis. Only healthy thyroids may be used for the provision of the active principle used therapeutically, so there must be efficient control of the abattoirs from which they are obtained.—S. Torres.

Hoobler, S. W., Kruse, H. D., & McCollum, E. V. (1937). **Studies on Magnesium Deficiency in Animals. VIII. The Effects of Magnesium Deprivation on the Total and Ultrafilterable Calcium and Magnesium of the Serum.** —*Amer. J. Hyg.* **25.** 86-106. 5 tables. [Numerous refs.] [See also *V. B.* **6.** 539].

Of a litter of 6 puppies, 4 were put on a Mg-deficient diet and the remaining 2 on to the same diet supplemented by Mg salts. Determinations were made weekly of total and diffusible Ca and Mg and inorganic P in the serum, and at other times when symptoms of Mg tetany developed. On the Mg-deficient diet animals showed a pronounced proportionate fall in both total and diffusible Mg with a moderate lowering of the total Ca and a disproportionate fall in the diffusible Ca compared with the controls. At periods marked by convulsions with values for diffusible Mg near the conjectured range of tetany, figures for diffusible Ca infrequently approached the critical point for Ca tetany and there was no concurrence between the lowest Ca values for each animal and the onset of convulsions. This indicated that the Ca-ion concentration of the serum was unconnected with Mg tetany and that the tetanic syndrome of Mg-deficiency was closely associated with the very low concentrations of serum-Mg-ions.—Alfred Eden.

Claussen, L. (1937). Untersuchung über die Histogenese der "Pusteln" der Schlundschleimhaut bei der Nährschädenerkrankung (A-Avitaminose) der Hühner. [**Histogenesis of Pustules on the Oesophageal Mucosa of Fowls with Avitaminosis A**].—*Dtsch. tierärztl. Wschr.* **45.** 161-164. 6 figs. [1 ref.]

A characteristic lesion in vitamin A deficiency in fowls consists of multiple small yellowish nodules situated chiefly beneath the mucosa of the oesophagus

and exuding on pressure a small amount of a caseating material. C. has studied the histological structure of these nodules, since there has been disagreement as to their nature.

The essential changes involve exudation into the lumen of the mucosal glands of a fluid containing leucocytes and red blood cells, and this is followed by degeneration of the gland epithelium. The resulting plug of caseous material is later expressed from the gland.—E. G. WHITE.

HEISE, F. H., & MARTIN, G. J. (1936). **Supervitaminosis C in Tuberculosis.**—*Proc. Soc. exp. Biol., N.Y.* **35.** 337-338. [8 refs.]

H. and M. treated 10 g. pigs with daily intraperitoneal injections of 20 mg. of crystalline cevitamic acid over a period of seven days after which these animals and five controls were given a measured dose of tubercle bacilli. On subsequent P.M. examination, there was no evidence that the administration of large amounts of vitamin C had protected against tuberculosis.—C. A. MCGAUGHEY.

HARRIS, L. J., PASSMORE, R., & PAGEL, W. (1937). **Vitamin C and Infection. Influence of Infection on the Vitamin-C Content of the Tissues of Animals.**—*Lancet.* **233.** 183-186. 3 figs., 2 tables. [8 refs.]

G. pigs suffering from an acute infection with *Salmonella typhi-murium* or *Pasteurella pseudotuberculosis*, or from the effects of diphtheria toxin, showed a considerable diminution in the amount of vitamin C present in their suprarenal glands as compared with controls which had received the same dietary intake of vitamin C. The vitamin C in the liver was not significantly affected. In tuberculous g. pigs in which the infection was running a chronic course there was a diminution in the amount of vitamin C in the suprarenals and also some evidence of a lowered concentration of the vitamin in the livers.—R. ALLCROFT.

PRINGLE, Emma M., & BAROTT, H. G. (1937). **Effect of Incubation Temperature on Time of Death of Chick Embryo and Relationship of Energy Metabolism to Mortality.**—*J. agric. Res.* **54.** 465-468. 1 fig., 1 table. [1 ref.]

The authors describe their method of procedure in 20 complete experiments carried out from 1932 to 1935, during which 878 fertile eggs were incubated at 102°F. and 791 eggs at 99°F. From results obtained they concluded as follows :—two-thirds of all mortality occurs during two critical periods, at incubation temperatures of 99°F. and 102°F. The first period occurs at the same time at both temperatures, the peak being at the third day, and the second period shortly before the normal time of hatching. The peak of mortality for eggs incubated at 99°F. is on the twentieth day and for those at 102°F. on the nineteenth day ; a close relationship exists between the stage of development of the chick embryo and mortality.—M. BURKE.

PUBLIC HEALTH.

VERGE, J., & THIEULIN, G. (1936). L'utilisation des laits tuberculeux. [**Utilization of Tuberculous Milk**].—*Rev. gén. Méd. vét.* **45.** 713-721. [1 ref.]

By a Decree dated 24th January, 1934, the milk of tuberculous animals and milk containing tubercle bacilli may be used for the food of men or animals, provided it is treated by heat so as to destroy the bacilli. But milk from animals suffering from advanced TB. of the lung, TB. of the intestine, the udder or the uterus may not be so used and must be destroyed. The authors discuss the means to ensure that the law is so carried out as to avoid risk of danger to public health.

—F. BULLOCK.

I. KARSTEN. (1937). Bang- und reaktionstuberkulosefreie Bestände als Grundlage für die Inverkehrgabe von Rohmilch im Kreise Zellerfeld i. Harz. [**Supply of Raw Milk in Zellerfeld i. Harz from Herds Free from Tuberculosis and Brucellosis**].—*Dtsch. tierärztl. Wschr.* **45.** 97-100. 3 tables.

II. SEELEMANN, M. (1937). Ergebnisse milchhygienischer Untersuchungen im Rahmen des Preisbewerbes für Milch und Milcherzeugnisse anlässlich der diesjährigen Reichsnährstands-Ausstellung. [**Tests on Graded Milk in Germany**].—*Z. Fleisch- u. Milchhyg.* **47.** 379-383. [2 refs.]

I. A report on tests for TB. and brucellosis carried out on herds supplying milk for holiday visitors at Zellerfeld i. Harz. 469 out of 697 herds were free from TB. and of 1,595 cattle tuberculin tested 1,201 were negative. Only 2·77% of the animals were affected with brucellosis. As a result the healthy herds were allowed to supply raw milk to the town.

II. In a milk competition in Northern Germany 200 samples of milk were examined for cell content, mastitis streptococci and *Brucella abortus*. 62 samples were completely disease-free, but the remainder showed one or both of the above infections.—G. HARTMANN (VIENNA).

SCHEIBE, H. (1937). Beweist ein positiver Agglutinationswert des Milchserums das Ausscheiden von Abortus-Bang-Bakterien mit der Milch? [**Relation between Agglutinins in Milk and Excretion of *Br. abortus* with Milk**].—*Tierärztl. Rdsch.* **43.** 417-421. 3 tables. [8 refs.]

S. confirms that *Br.a.* may or may not be excreted in milk which reacts positively to the serological test, and states that there is no connexion between these two factors. The animal inoculation test is necessary to determine whether or not *Br.a.* is present in milk. [He does not mention cultural methods.—Ed.]
—G. HARTMANN (VIENNA).

KLIEWE, H., & HERWIG, H. (1936). Bakteriologische Untersuchungen in der Giessener Milchzentrale. [**Bacteriological Tests of the Giessen Milk Supply**].—*Arch. Hyg., Berl.* **117.** 179-186.

A general description of the treatment of milk supplied to the central dairy by producers. Examples of bacterial counts made from raw and pasteurized milk are given; they were considered to be satisfactory. Cocci including mastitis streptococci were seen in nearly all smears from samples; *Brucella abortus* has not been found. The microscopic method was found unreliable in demonstrating the presence of tubercle bacilli. G. pig tests were necessary.—J. E.

TRAWIŃSKI, A. (1937). Das Fleischproblem in Polen im Jahre 1935. [**Meat Inspection and Disease found in Slaughtered Animals in Poland**].—*Z. Fleisch- u. Milchhyg.* **47.** 298-299.

Poland is divided into 2,614 meat inspection districts containing 1,020 public abattoirs. In 1,028 districts meat inspection is carried out by veterinarians and in 1,586 districts by others. Trichina inspection is carried out by 524 (non-veterinary) trained persons although veterinarians do a little of this work too. Bacteriological meat inspection is carried out by the state veterinary institutes as well as in special laboratories attached to five abattoirs.

In 1935, 7,786 equines, 1,148,483 cattle, 2,047,360 calves, 3,604,737 swine, 385,889 sheep and 17,332 goats were slaughtered in Poland. Tuberculosis was found in 8·2% of adult cattle, 0·03% of calves, 2·18% of pigs and 1·08% of sheep and goats. Cysticerci were found in 1,168 cattle, 14 calves and in 12,765 pigs; echinococci in 4,710 cattle, in 77 calves and in 83,121 pigs, and trichinae in 1,931 pigs.—G. HARTMANN (VIENNA).

SABA, M. (1936). Inspection des viandes et abattoirs en Syrie. [**Meat Inspection in Syria**].—*Rec. Méd. vét. exot.* **9.** 102-117. [1 ref.]

The above title seems to be a misnomer because no details are given as to the diseases which are found in animals slaughtered for human consumption. These animals are chiefly fat-tailed sheep derived from Turkey and Irak. The buffaloes slaughtered are generally old animals and only converted into meat after they have been used for work. The flesh is dark-red, non-elastic and fibrous, and the fat is white and contains much protein, phosphorus and iron. Camels are also slaughtered for human food ; the flesh is said to be preferred by the Arab.

A full description is given of the rules and regulations for municipal hygiene which, if carried out strictly, appear to be more satisfactory than those in this country.—T. DUNLOP YOUNG.

SHAW, W. V. (1937). **Report of an Outbreak of Enteric Fever in the County Borough of Bournemouth and in the Boroughs of Poole and Christchurch.** —*Rep. publ. Hlth med. Subj., Lond.* No. 81. pp. 25. 1 table, 5 charts, 1 plan, 7 appendixes. [2 refs.]

The infection originated from stream water contaminated with sewage infected by a human carrier. It is concluded that the outbreak was due to the consumption of a supply of raw milk infected from one, and possibly two, small holdings using the stream for the watering of cattle and possibly the washing of milk utensils. It is suggested that the cows might possibly have conveyed the infection through :– (1) fouling of the teats and udders whilst standing in the stream to drink ; (2) drinking infected water and excreting the organism in the dung or urine, followed by contamination of the milk during milking, and (3) infection of the cows with excretion of the bacilli in the milk.

Since it has not been proved that either the second or third methods of infection do occur, it was concluded that the second method was the most probable.

The outbreak was of the explosive type, practically all the cases occurring within four weeks. 718 cases were reported.

Pasteurization of the milk appears to have cut short the outbreak ; the milk apparently being infected 31 days before this measure was adopted.—H. E. B.

DACK, G. M. (1937). **Staphylococci in Relation to Food Poisoning.**—*Amer. J. publ. Hlth.* **27.** 440-443. [17 refs.]

Describes an enterotoxic substance formed by a few strains of staphylococci under certain conditions, especially in presence of starch and/or protein. Enterotoxin does not distil off, is not dialysable, is markedly unstable to N/100 NaOH and to heat in N/100 HCl, is removed from acid aqueous solution with ethyl ether and chloroform, is not completely destroyed by exposure for 30 minutes at 212°F. and does not disappear, although weakened, by storage at low temperature for 67 days. It is not a true exotoxin since it evokes no production of antitoxin. Outbreaks of food poisoning due to staphylococci chiefly follow consumption of cream-filled pastry, also cheese, gravy, doughnuts, ice-cream and meat sandwiches. Heat sterilization of these foods is recommended.—H. BURROW.

GLASSER. (1937). Beobachtungen bei einer Fleischvergiftung bedingt durch den Paratyphusbazillus B (Schottmüller). [**Meat Poisoning caused by** *Salmonella enteritidis*].—*Dtsch. tierärztl. Wschr.* **45.** 7-9.

An outbreak of meat poisoning affecting 200 people in a town in Germany was traced to the flesh of a cow which had been slaughtered in emergency (injury

at parturition) without being examined bacteriologically. The period of incubation in the affected persons was long (14 days) and there was consequent delay in tracing the origin.

Such outbreaks of food poisoning are very difficult to trace.—G. H. (VIENNA).

I. QUANDER, J. (1936). Untersuchungen im Schlachthof zu Hirschberg gesund geschlachteter Tiere auf Bakterien der Enteritis-Gruppe. [**Examination of Healthy Cattle for Paratyphoid Bacteria**].—*Inaug. Diss., Berlin.* pp. 26. 1 table. [Numerous refs.]

II. DIERKES, F. (1936). Bedeutet das Belassen der geschlachteten Kälber im Fell eine Gefahr für den Menschen. [**Possible Danger of Selling Slaughtered Calves in their Skins**].—*Inaug. Diss., Hanover.* pp. 23. [Numerous refs.]

I. In no case was any paratyphoid organism found in the bile, portal lymph nodes or mesenteric lymph nodes of 225 cattle, 226 calves or 227 pigs. Similar tests on 30 horses, using a piece of liver, and portal and mesenteric lymph node, were also negative.

II. Samples of skin attached to the carcasses of 500 slaughtered calves were examined for "*Salmonella enteritidis* Gärtner (Kiel)". In 22 of them the organism was found, but in every case the skin had been contaminated by faeces. It is suggested that to avoid infection of the flesh from the skins, calves should be flayed.

—G. HARTMANN (VIENNA).

TOUPAÏTCH, M. M. (1937). La réglementation de l'enfouissement des cadavres et des débris animaux. [**Regulations Concerning the Burial of Carcasses**]. —*Bull. Off. internat. Epiz.* **14.** 252-273. Discussion pp. 456-467 and Resolution p. 481. 9 figs.

TODOROFF, A. (1937). Le réglementation de l'enfouissement des cadavres et des débris animaux. [**Regulations Concerning the Burial of Carcasses**].—*Ibid.* 274-285. Discussion pp. 456-467 and Resolution p. 481. 3 figs.

Different methods for the disposal of carcasses and animal refuse have been carefully considered and include the following :–

(1) Burial. Difficulties attached to this method of disposal are cost, labour, unsuitable soil, danger of contaminating domestic water supply and spread of disease by contamination of the soil, *e.g.* anthrax.

(2) Industrial utilization. The difficulties here are distance from farms, cost of transport, the economic employment of the necessary permanent personnel and the need of veterinary inspectorate staff to ensure that carcasses so disposed of are not responsible for the dissemination of disease until destroyed.

(3) Burning. It is difficult in some regions to obtain suitable and sufficient incendiary material.

The Committee of the Office International des Épizooties draws attention to the industrial disposal of carcasses and animal refuse, which ought to be considered as the best method and adopted wherever possible. It points out that the progress realized in the knackery industry, hygienically and economically, widens the range of such possibilities. However, in all cases where recourse to such industrial disposal or to incineration is impossible, careful burial generally constitutes the only satisfactory method.

The burial ought to be carried out according to established police sanitary regulations. Such regulations could be formed on the basis of those set out by Toupaïtch and Todoroff.—T. DUNLOP YOUNG.

THERAPEUTICS.

I. Svensson, S., & Hedström, H. (1937). Kloraminförbrukning i mjölk. En kemisk och bakteriologisk studie. [**Action of Chloramin on Milk and on Milk Streptococci**].—*Skand. VetTidskr.* **27.** 248-269. 13 tables. [4 refs.] [English summaries pp. 258-259 and 268-269].

II. Hülphers, G. (1937). Desinfektionsförsök med kloramin på tuberkelbaciller. [**Disinfectant Action of Chloramin on Tubercle Bacilli**].—*Ibid.* 213-221. 1 table. [8 refs.] [English summary].

I. Chloramin (p toluolsulphonchloramid sodium) has a strong disinfectant action on many bacteria suspended in water. The effect is diminished by the presence of protein so that in actual practice its value is greatly reduced. The authors investigated the effect of clean milk on chloramin and found that the latter is neutralized to a large extent by combination with the amino groups of the protein present. It is probable that the bactericidal effect of chloramin is due to its combination with the protein present in the bacterial cells. In milk, chloramin is decomposed to form hypochlorite which reacts with the NHCO groups of the protein, forming aromatic malodourous aldehydes. The bactericidal action of the hypochlorite is probably very small. H. tried the disinfectant action of chloramin on mastitis streptococci, on types of *Str. agalactiae* and on *Str. equi*, suspended in physiological saline and in milk. In the concentration of 0·2 : 1,000 it killed the cocci suspended in saline after one hour. In the concentration 2·5 : 1,000 it killed the cocci suspended in milk after one hour ; a concentration of 2 : 1,000 was not sufficient to produce the same effect.

II. H. tried the disinfectant effect of chloramin containing 25·9 % of active Cl, and of a mixture of chloramin and sodium chloride (active Cl 12·3 %). In all investigations he mixed one part of human sputum, or one part of sediment of lung mucus from cattle, or one part of uterine secretion from cattle and 10 parts of the testing solution. He used g. pigs as the test animals. A solution of 5 % chloramin killed the tubercle bacilli in sputum from man after one hour and the bacilli in lung mucus from cattle after two hours. In uterine secretion the bacilli were dead after the action of 3 % and 5 % solution in two hours. A 5 % solution of the mixture of chloramin and sodium chloride referred to above killed the bacilli in uterine secretion after one hour. The bacilli were not killed in a 3 % solution.

—H. Berthelsen (Stockholm).

Karlson, J., & Ridala, E. (1936). Ravikatseid kemoterapeutiliste vahenditega piimalehmade kettpisikute-udarataudi puhul. [**Chemotherapy of Mastitis**]. —*Eesti loomarstl. Ring.* **12.** 81-118. 5 tables. [Numerous refs.] [German summary].

Cows affected with mastitis caused by *Streptococcus agalactiae* were treated by udder infusions of " entozon" (1 : 1,250, rarely 1 : 800-1 : 1,000) or by " trypaflavine" (0·1 : 1,000) *via* the teat canal. In two herds 69 out of 92 quarters treated with " entozon " were freed from infection as also were 5 out of 11 quarters treated with " trypaflavine ". In most cases one or two infusions were sufficient to cause the disappearance of the organisms from the milk and the treatment was most successful when applied during the latter half of lactation or during the dry period. The authors also discuss general control measures for mastitis in dairy herds.

—Elfriide Ridala (Tartu).

Zeller, H., & Stockmayer, W. (1936). Die Wirkung des Volkmarverfahrens und der Sufrogelbehandlung auf Rinderbrucellose. [**The Volkmar and Sufrogel Treatments of Bovine Brucellosis**].—*Z. InfektKr. Haustiere.* **50.** 165-179. 4 tables. [1 ref.]

The therapeutic value of two preparations containing sulphur and various mineral salts was tried in the prevention of contagious abortion. After a somewhat prolonged course of treatment with each of the compounds 6 pregnant heifers were infected with a culture of *Br. abortus* while an equal number were untreated. A detailed account of the results is given and it is clear that the two compounds in no way influenced the course of infection.—S. J. EDWARDS.

ROBINSON, W. (1936). **Use of Urea to Stimulate Healing in Chronic Purulent Wounds.**—*Amer. J. Surg.* **33.** 192-197. [8 refs.] [Abst. from abst. in *Bull. Inst. Pasteur.* **35.** 383].

It has been found that the therapeutic action of maggots in wounds is due to the production of purine compounds by them. These compounds give rise to urea. As a result of this observation, R. tested the effect of 2% urea on purulent wounds and found that healing took place equally as well as in maggot-treated wounds. Urea is, therefore, recommended in place of maggots.

CUNNINGHAM, Marion M. (1937). **Further Data on the Vitamin D Content of New Zealand Fish Liver Oils.**—*N.Z. J. Sci. Tech.* **18.** 898-899. 1 table. [7 refs.]

The vitamin D content of the following fish liver oils was ascertained :–

Kahawai (*Arripis trutta*)	350 international units per g.
Tarakihi (*Dactylopagrus macropterus*) ...	17 international units per g.
Black flounder (*Thombosolea retiaria*) ...	1,400 international units per g.
Snapper (*Pagrosomus auratus*)	57 international units per g.
Red cod (*Physiculus bachus*)	3 international units per g.
Shark (*Elasmobtanchii*)	13 international units per g.

—C. S. M. HOPKIRK.

POISONS AND POISONING.

EMMEL, M. W., & HENLEY, W. W. (1937). **The Effect of Feeding p-Dichlorobenzene-Treated Corn to Swine.**—*J. Amer. vet. med. Ass.* **91.** 59-63. 1 table. [3 refs.]

Of a group of 11 pigs, 5 were fed for 15 days on fish-meal, middlings and maize which had been treated with p-dichlorobenzene as a fumigant for the destruction of weevils. Four were similarly fed for 28 days and two were fed on unheated maize, middlings and fish-meal to serve as controls. After these periods of feeding the animals were given the control groups' food and were periodically killed off and examined (a) for lesions, and (b) for taint in the meat.

The meat of animals fed for 15 days on the treated maize was distasteful and unfit for food and after the 15-day period it was 62 days before the meat was edible ; after the 28-day period of feeding it took approximately 85 days before the meat was fit for consumption. The only macroscopic lesions seen were cloudy swelling of the heart, kidneys and liver, but microscopic examination revealed cloudy swelling in all parenchymatous organs and involuntary muscle.—A. EDEN.

STEYN, D. G. (1936). **Recent Investigations into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa.**—*Onderstepoort J. vet. Sci.* **7.** 169-178. [3 refs.]

Biological tests were conducted with *Denekia capensis* Thunb., *Geigeria aspera* Harv., *Inula graveolens* Desf., *Pyrethrum extract*, *Senecio bupleuroides* D.C.,

Sorghum saccharatum Pers., *Acacia giraffae* Willd., *Acacia saligna* Wendl., *Cassia absus* L., *Crotalaria Burkeana* Benth., *Lotononis calycina* var. *hirsutissima* Düm (hydrocyanic acid tests only), *Dipcadi glaucum* Bkr., *Ornithogalum Pretoriense* Bkr., *Scilla ovalifolia* Bkr., *Tulbaghia acutiloba ex descrip.*, *Urginea altissima* Bkr., *Oxalis Smithii* Sond., *Thesium triflorum* Thb., and *Cissus Juttae*.

It appears that *Geigeria aspera* decreases in toxicity on storage. Drenching with 50 c.c. of pyrethrum extract caused death in a sheep on the 5th day with symptoms of paralysis. Hydrocyanic acid was found in *Sorghum saccharatum* and *Acacia giraffae*. Sheep drenched with *Crotalaria Burkeana* develop pronounced painfulness in the hoofs. *Dipcadi glaucum* and *Urginea altissima* were found to be poisonous.

HODGSON, E. E. (1937). **Poisonous Plants of Hawaii.**—*Vet. Bull. U.S. Army.* **31.** 26-28.

Owing to the presence of poisonous plants the problem of forage for military animals in the Hawaiian army department is serious. A list of the popular names of some 26 of the more common poisonous plants is given together with references to the kinds of poison found in each. No fungi or bacteria are included in this list.—ALFRED EDEN.

GONDA, S. (1936). Kerek repkény (Glechoma hederacea) mérgezés háziállatokon. [**Ground-Ivy** (*Glechoma hederacea*) **Poisoning in Livestock**].—*Állatorv. Közl.* **33.** 173.

Ground ivy is only eaten by livestock when forage plants are lacking. Symptoms of poisoning differ in horses, cattle and swine, but in general the poison acts on the thoracic organs. Lesions found P.M. include pulmonary oedema, enteritis and swelling of the spleen, liver and kidneys.

—Z. DE CSUKÁS (MAGYARÓVÁR).

PHYSIOLOGY.

ROUX, L. L. (1936). **Sex Physiology of Sheep.**—*Onderstepoort J. vet. Sci.* **6.** 465-717. Numerous figs., tables, diagrams and appendixes. [Num. refs.]

The major part of this report is based on a series of experiments dealing with various aspects of the sex physiology of the non-pregnant ewe. The second part deals with the application of some principles of sex physiology to practical sheep husbandry. A series of nine experiments were carried out on sex physiology embracing such questions as, (1) the influence of nutrition on the sexual activity of non-pregnant merino ewes, (2) the morphology of the ovaries during anoestrus, (3) the duration of the phases of the di-oestral cycle, (4) the period of the absence of oestrus after parturition, (5) the sexual season of cross-bred sheep, (6) the age of puberty of cross-bred and merino sheep, (7) the influence of climate on the sexual activity of young merino ewes, (8) the influence of inoculation against bluetongue, shearing and dipping on the oestral cycle, and (9) the artificial induction of oestrus during anoestrus.

In the second part a study of the fertility of maiden merino stud ewes was made over five seasons under Karoo (Cape) Free State and Western Transvaal conditions.—E. M. ROBINSON.

I. NESENI, R. (1936). Der Blutkalcium und Kaliumspiegel von Schlachtrindern und Schweinen bei verschiedenen physiologischen und pathologischen Zuständen. [**Blood Calcium and Potassium Variations in Slaughtered**

Cattle and Swine].—*Dtsch. tierärztl. Wschr.* **44.** 560-564. 6 tables. [20 refs.]

II. SEEKLES, L. (1936). Die Bindung des Calciums, Magnesiums und anorganischen Phosphors an die Eiweisskörper des Rinderblutserums bei verschiedenem pH. [**The Fixation of Calcium, Magnesium and Inorganic Phosphorus to the Proteins in Ox Blood Serum**].—*Acta brev. neerl. Physiol.* **6.** 83-84. [In German].

I. N. records Ca and K data on abattoir blood and finds variations with age, sex, different diseases and method adopted for slaughtering. He says that comparisons should only be made on animals killed by the same method, but this arbitrary variable in itself partly invalidates his findings in relation to disease. For instance the average Ca value for 37 animals killed by the Schermer apparatus was 10·66 mg. p.c. (range 8·20 – 13·01) as against 8·65 mg. p.c. (range 5·21 – 10·97) for 19 pole-axed animals, and 8·51 mg. p.c. for 6 cases of generalized tuberculosis. His conclusion that serum calcium is lowered in advanced tuberculosis may be correct, but would have been much strengthened if the blood samples had been taken before slaughter. [Changes in value of certain mineral constituents in blood may occur after death irrespective of the method of slaughter].

II. *In vitro* experiments showed that shift of pH of blood towards the alkaline side only slightly decreased the proportion of diffusible calcium in relation to total, but that shift to the acid side markedly increased it, until at pH 4·1 all calcium became diffusible. The question is raised as to whether a shift of pH from the normal of 7·4, to 7·2 or 7·1 would increase the ionized Ca fraction sufficiently to alleviate paresis in milk fever.—H. H. GREEN.

EVELETH, D. F., EVELETH, M. W., & WALSH, F. E. (1937). **The Inorganic Phosphorus of the Serum of Dairy Cattle.**—*N. Amer. Vet.* **18.** No. 9. 18-22. 5 tables. [6 refs.]

Results of a large number of serum inorganic P-determinations on normal Holstein and Jersey cattle of all ages and under the same environmental conditions are given. There is evidence of a slight breed difference, the level for the Holstein cattle being higher than for the Jerseys, up to the age of 48 months.—R. ALLCROFT.

MISCELLANEOUS.

GREAT BRITAIN. (1937). **Report of the Special Committee Appointed by the National Veterinary Medical Association to Study the Subject of Small Animal Euthanasia.** pp. 59. 15 figs. on 9 plates. London: Nat. Vet. Med. Ass. [8vo] [5s.]

In nearly 2,000 cases occurring in the routine duties of its members, the Committee studied all existing methods (which are fully discussed), but it refrained from experimenting with new or untried methods. It points out the impossibility of saying categorically that any one method is the best, owing to the varying circumstances, *e.g.* the nature of the premises, assistance, available, the skill of operator, etc.

Shooting with the captive bolt pistol, aimed at the front of the head, is strongly recommended as rapid and humane, but not with instruments discharging free bullets, because of the element of danger. Where the use of an anaesthetic drug is stipulated or indicated, the Committee prefers the use of those of a non-volatile nature, followed by hydrocyanic acid or some other lethal agent if necessary. For dogs, however, morphia followed by chloroform is regarded favourably.

In the experience of the Committee nembutal was the most satisfactory of the non-volatile anaesthetics because of the choice of routes of administration available, but fluid avertin, evipan sodium, and magnesium sulphate (all intraven.) are also recommended. Particulars of dosages are given and the technique of intravenous injection in dogs and cats described. An electrical lethal chamber is described and strongly recommended, but lethal gas chambers are not recommended.

Electrical stunning is fully dealt with and, in favourable conditions, is recommended. Mass destruction of dogs and cats is deprecated, as is also the use of strychnine and of hydrocyanic acid without the previous use of a narcotic.
—E. E. JELBART.

FRIEDEMANN, U. (1937). **Further Investigations on the Blood-Brain-Barrier. The Significance of the Electrical Charge and the Zeta-Potential in the Problem of the Blood-Brain-Barrier and Capillary Permeability in General.** —*J. Immunol.* **32.** 97-117. 8 tables. [Numerous refs.]

In studying the permeability of the cerebral capillaries it was found that basic dyes stained the brain more readily than acid dyes. The difference between basic and acid dyes is partly due to their affinity for brain tissue, and partly because basic dyes appear to permeate the cerebral capillaries more easily. The permeability of the cerebral capillaries is dependent on the electric charge, and it is not related to the chemical structure, size or lipoid solubility of the substance. The passage of toxins through this barrier, however, is governed by the zeta-potential of the toxin. [The zeta-potential of a colloid is the potential difference between the electrical double layer on the surface of the particles and the surrounding fluid, and it can be calculated from the cataphoresis velocity of colloids by Helmholtz' and Smoluchowski's formula. The zeta-potential is negative at the isoelectric point and rises steeply on either side of it]. Staphylococcus toxin cannot pass the blood-brain barrier, it carries a negative charge at the pH of the blood, and its isoelectric point is about pH 6·2.

[The old conception, as propounded by ERHLICH, was that chemical affinities alone governed the relations of toxins to the brain; this has been replaced by the idea of a selective mechanism regulating the exchanges of substances between the blood and the brain termed the blood-brain barrier. This barrier is localized in the walls of the cerebral capillaries, the role of the choroid plexus being insignificant. Electrical charge is an important factor in the permeation of substances through this barrier].—D. L. HUGHES.

GOVERNMENT OF INDIA. (1936). **(Fifth) Report showing the Progress made in giving Effect to the Recommendations of the Royal Commission on Agriculture in India up to the end of 1935. Part 1. Central Government. Part 2. Local Governments and Administrations.** 2 vols. pp. 32 and 74. [fcp] [Re.1] [1s. 9d.]

[This fifth report brings up to date the matter dealt with in the earlier ones].

A bill is in preparation for an all-India Contagious Diseases of Animals Act. It has been found impracticable to adopt a uniform rate of emolument for Veterinary Advisers in the Provinces. Because of financial stringency it has not yet been found possible to give higher veterinary education at one Indian veterinary college as had been proposed.

The administrative control of the Imperial Institute of Veterinary Research, Muktesar, has passed to the Director of that Institute; the research workers have been reorganized, and some changes have been made in the internal economy of the institute.

The Provinces have little to report in the way of progress. Throughout the country, goat-virus vaccination for the control of rinderpest has, to a very great extent, displaced the serum-simultaneous method.—G. WILLIAMSON.

ANON. (1936). Iškilmingai atidaryta Veterinarijos akademija. [**The Opening of the Veterinary Academy, Kaunas**].—*Vet. ir Zootech., Kovno.* **13.** 206-219. 1 photograph.

On September 19th, 1936, the Veterinary Academy of Lithuania was opened. The newly appointed Director gave a short survey of the history of veterinary education in Lithuania, which dates from the opening of the Veterinary Academy in Vilna in 1775; the latter was later made part of Vilna University and in 1840 it was transferred to St. Petersburg. A fresh attempt to found a veterinary school was made in 1922, but it had to be abandoned in 1928. The Director then gave a survey of the veterinary work to be done in Lithuania and the role which the Academy is hoped to fill. Six lecturers will be appointed by the Ministry of Agriculture and one by the University. Sixteen internal and nine external students have been accepted. The lectures will take place in the University.—A. W. MOLLER.

KESTER, O. (1936). Projekt za gradnju prve veterinarske ambulante u Jugoslaviji. [**Plan to Found the First Veterinary Dispensaries in Yugoslavia**].—*Jugoslov. vet. Glasn.* **16.** 280-283. 3 plans.

K. considers that a large number of veterinary dispensaries should be provided for Yugoslavia, on the lines of those recently instituted in Bulgaria. The first dispensary has now been erected at Oborovo, near Zagreb. Free treatment is given to the sick animals of poor people and richer ones pay fees. Three plans for dispensaries are given.—B. OSWALD (SPLIT).

ANON. (1937). Per l'assunzione dei Veterinari in A.O.I. [**Regulations for Veterinary Service in Italian East Africa**].—*Azione vet.* **6.** 1-6.

Applicants for appointment to all technical services in I.E.A. [Eritrea, Italian Somaliland and Abyssinia] must belong to the Fascist Party and to their Syndicate. Preference will be given to men who served in the Abyssinian war. This decision, announced by a Confederal Circular, is a great disappointment to the National Syndicate of Veterinarians, who had proposed that the vacancies in the Colonial Veterinary Services should be filled by competition, and that there should be constituted a body of civilian veterinary services for the Colonies with a proper organization. The health and veterinary services in Italian East Africa will be under the control of the local military governors with the assistance of medical and veterinary officers of health, and this article lays down the conditions of pay and promotion.—F. BULLOCK.

PREIN, W. (1936). Neuordnung des Veterinärwesens im Iran unter Mitwirkung deutscher Tierärzte. [**New Veterinary Organization in Iran Instituted with the Assistance of German Veterinarians**].—*Dtsch. Tierärztebl.* **3.** 304-307.

Recently a beginning was made to organize an efficient veterinary service in Iran. Dr HAMEDY, a graduate of Alfort veterinary college, was appointed Chief Veterinary Officer and on his invitation German veterinarians were invited to go to Iran and help to found the necessary departments. Four German veterinary professors were appointed to the veterinary school at Keredj (30 km. from Teheran) and other veterinarians from Germany (4), Hungary (3), and Austria (2) were appointed to the new provincial veterinary service. Details are given of the organization of the service, of a contagious diseases law and of abattoir arrangement. The official language is French.—J. E.

I. ANON. (1937). **Mathematics and Medicine.**—*Lancet.* **232.** 31.
II. HILL, A. B. (1937). **Principles of Medical Statistics.**—*Ibid.* 41-43, 99-101, 161-163, 219-221, 281-284, 337-340, 402-405, 459-461, 527-529, 583-586, 646-648, 706-708, 771-773, 825-827, 883-885, 941-943 and 1001-1003. 8 figs., 41 tables. [1 ref.]

I & II. Statistical technique is a tool, the function of which should be familiar to the experimentalist even if he is not expert in handling it. This series of articles by Dr A. B. HILL of the London School of Hygiene, deals with the commoner methods the statistician uses in assessing the significance of numerical results. Relatively simple terminology, with a minimum of mathematics, is used and each method is illustrated by examples of interest to the public health officer and medical practitioner, and also, therefore, to the veterinarian.

Exposition is clear and should help to dispel the prejudice in many non-mathematical minds against the application of a technique they do not understand to problems upon which they are experimentally engaged. The illustrative examples make it clear to the reader that fruitful application of statistical methods to any given body of scientific data requires not only a knowledge of statistical technique but also of the science behind the data. The methods may expose fallacies and point to the operation of unsuspected factors, but do not tell the nature of those factors – for that the experience of the relevant science is required. They deal primarily with " numerical relationships " and can say whether any given array of data is " significant ", in the sense of " containing correlationships " and of not being " attributable to chance ", but do not say what the data signify – so that an unwary experimentalist may still assign a plausibly wrong explanation to " statistically significant " results which would better fit a different scientific cause.

A sound grasp of elementary statistical principles is almost of more importance in planning an experiment than in interpreting results, and it is quite useless to call in a professional statistician at the last moment to analyse an array of figures which have been wrongly collected. If Dr HILL's articles convince readers that such a grasp is not difficult to acquire, and in many branches of technical work is as essential as the ability to add, subtract, multiply and divide, they will have served their purpose.—H. H. GREEN.

OFFICIAL AND OTHER REPORTS.

GREAT BRITAIN. (1937). **The Lister Institute of Preventive Medicine. Report of the Governing Body 1937.** pp. 22. [Numerous refs.] London: Lister Institute of Preventive Medicine. [4to].

VIRUS DISEASES.—Dr SALAMAN continued his investigation into the antigenic structure of vaccinia virus. Dr AMIES carried out further research on the nature of tumour-producing agents in filtrates of avian sarcomata. Using highly potent suspensions of the Rous No. 1 sarcoma agent as antigen, it was found that fowls bearing this tumour develop antibodies for the tumour agent. Normal adult fowls occasionally have similar antibodies, but they were not found in 6-10 week old chickens. Dr HURST observed that in the rabbit and g. pig rabies follows an intravenous or intramuscular inoculation more readily when the infecting material is g. pig brain than when it is rabbit brain. Dr GUTSTEIN has elaborated a method for the rapid staining of elementary bodies, based on the use of basic dyes in alkaline solution, no mordant being required.

SEROLOGICAL STUDIES.—Further work on the " Vi " antigen of *Salmonella typhi* was undertaken. Drs SCHUTZ and GORER continued their investigations

into the influence exerted by genetic constitution upon immunity and immune processes. Significant genetic and sex differences were observed in resistance to infection and in ability to produce antibodies, but there seems to be no simple relationship between these two factors.

General Bacteriological Studies.—Modifications in the technique of the Chick-Martin method of testing disinfectants are noted, *e.g.* dried yeast is substituted for dried faeces as the organic matter.

Endocrinology.—Investigation of the effects of sex hormones was continued and included enquiry into their bisexual function, and the changes produced by the male hormones alone or in combination with the female hormone on the female genital organs.

Nutrition.—Reference is made to work on standardization undertaken in connexion with vitamins A and B.

Therapeutic Serology.—An *in vitro* analysis of the antigens of *Clostridium welchii* is still in progress. The relationship of the new type of bacterial antigen mentioned in last year's report to the " D " type of toxin elaborated by *Cl. welchii* (*ovitoxicus*) has not yet been established. Dr Henderson has continued his study of the antibodies in specific antibacterial sera which control experimental infection with *Cl. oedematis maligni*; it is suggested that antibacterial prophylaxis is a practical possibility in the control of infection associated with this organism. Dr Petrie has studied the immunization of rabbits and horses against streptococci.

National Collection of Type Cultures.—200 new strains were deposited for maintenance. A new and revised edition of the Catalogue of the National Collection of Type Cultures was published during the year.—J. C. Wallace.

Great Britain. (1937). **Annual Report for Year ending 30th September, 1936. The National Institute for Research in Dairying, University of Reading.** [Kay, H. D.] pp. 78. 8 tables. Reading: Nat. Inst. Res. Dairying. [4to].

The report consists of two sections: the first deals with changes in staff, appointments, utilization of new information by the Dairy Industry, and the financial position, and the second gives the reports of the various departments.

The health of the institute herd continues to be satisfactory except for the presence of Contagious Abortion. No reactors were found at the September, 1935, tuberculin test, required in respect of the licence to sell Tuberculin Tested Milk, but two were found at the April, 1936, test. Experimental work of the Dairy Husbandry Department included such subjects as inheritance of milking qualities, protein requirement of dairy cows for milk production, and the use of raw and pasteurized milk in calf rearing, in addition to many others.

The staff of the Bacteriological Department continued the study of the performance of types of apparatus for high temperature short time pasteurization. Under Market Milk Investigations the application of the phosphatase test, the methylene blue reduction test and the significance of coliform organisms in pasteurized milk are considered. Summaries of published papers are given.
—J. C. Wallace.

Australia. (1936). **The Tenth Annual Report of the Council for Scientific and Industrial Research for the Year ended 30th June, 1936.** pp. 96. 7 tables. Canberra: L. F. Johnston, Commonwealth Govt. Printer. [fcp] [4s.]

[Original accounts of many of the research projects referred to below were published elsewhere; they are dealt with in the *Index Veterinarius* and the *Veterinary Bulletin* as they appear].

Rabbit Myxomatosis.

In experiments in England the mortality from the disease was 100% in wild (European) rabbits and the disease is highly specific for the European wild rabbit (from which the Australian rabbit is descended) and so far it has not been produced in other animals. It is proposed to carry out tests of the susceptibility of domestic animals and native fauna under quarantine conditions in Australia, and if results are negative, consideration will be given to carrying out a field test, probably on an island, in order to determine the efficiency of the virus in exterminating rabbits under natural conditions.

Contagious Bovine Pleuro-Pneumonia.

Great impetus was given to the pleuro-pneumonia investigations by the development of the insufflation method for the artificial dissemination of the disease, and of the complement-fixation test for its diagnosis. The reliability of the insufflation method of infection has been further tested and fully proved. Its employment has considerably simplified the immunity experiments. There has been increased use of laboratory-prepared culture virus for immunizing purposes by stockowners. The complement-fixation test has been successfully employed in connexion with control of natural outbreaks of the disease in two States, and in one of them has made possible the movement of cattle from hitherto prohibited areas.

Internal Parasites of Sheep.

(a). Observations on viability and resistance to desiccation of eggs and larvae of *Haemonchus contortus* and *Trichostrongylus spp.* It has been found that very brief periods of desiccation in sunlight are fatal to eggs of both genera, while the survival of the infective larvae when exposed to desiccation is less than was previously supposed. Where pastures are left unstocked from one to two months during periods of continuous dry weather the degree of infestation with both genera is greatly reduced, and in the case of *H.c.* complete eradication may be effected. Results indicate that, for the successful development of a high proportion of larvae of either species, periods of some days of continuous rainy or cloudy weather are necessary. On the other hand, brief showers which are followed by fine weather are of little importance in increasing the risk of infestation to sheep.

(b). *Chabertia ovina.* The pathogenic effects of infestation with immature parasites of this species on the growth rate and health of lambs has been confirmed.

(c). *Nematodirus filicollis.* Preliminary experiments lend support to observations made under field conditions that the parasite is relatively benign. Experiments are now in progress to determine whether massive infestations such as are not infrequently met with in the field may be of definite pathogenic importance.

(d). *Oesophagostomum columbianum.* An improved method of administering solutions of sodium arsenite in the form of enemas has been developed and tested in the field. Results have been encouraging and the method has been generally recommended for the control of all large bowel parasites.

(e). Treatment of trichostrongylosis. Extensive tests of a large series of drugs have been carried out and as a result recommendations have been made for the employment of a combination of copper sulphate and nicotine sulphate. This combination has already been adopted and widely used throughout Australia and has improved the position regarding control of this disease. Experiments have shown that routine administration of this combination will effectively prevent the development of symptoms of trichostrongylosis in lambs exposed to heavy daily infestation.

(f). Passage of fluids to the ruminant stomach. Satisfactory passage of solutions of copper sulphate to the abomasum was obtained even when the volume

was reduced to 5-10 ml. It was indicated that the closure of the oesophageal groove is induced by contact of the solution with the buccal mucosa. Based on this and on additional experimental results the recommendation has been made that 5% solutions of copper sulphate, and copper sulphate and nicotine sulphate, may be employed in preference to the 2% solutions usually given to sheep in Australia. Reduction in the volume of the dose leads to greater convenience and ease of administration of anthelmintics.

Tick Paralysis in Dogs.

It was found that the resistance of dogs previously exposed to repeated and massive infestation with adult female ticks (*Ixodes holocyclus*) declined markedly after a period of from 8-11 months, though still adequate to protect them from fatal attacks of the disease. Following the demonstration of the curative value of the serum of dogs immunized to tick paralysis and the employment of such serum in over 150 cases, arrangements have been made to prepare the serum on a commercial scale.

Foot-Rot.

It has been shown that in all cases of naturally occurring foot-rot an organism with the cultural and morphological characters of a spirochaete is present and it is suggested that it may be the primary cause of the disease. Foot-rot has not yet been produced by pure cultures of the organism, or by mixtures of it with *Fusiormis necrophorus* or other organisms found in naturally occurring cases. The spirochaete does not survive in infective material from natural cases for more than a week at room temperature. Preliminary field experiments have shown that contaminated soil, even though moist, loses its infectivity in less than three days. Field trials are being initiated to determine whether control and eradication may be effected by the complete elimination and isolation of all sheep showing active or latent lesions. *Fusiformis necrophorus* anaculture had little or no value in the control of foot-rot in sheep but in cattle the results have been encouraging.

Botulism in Sheep.

It has been found possible to produce in sheep a strong immunity against the toxin of *Clostridium botulinum* C. Under natural conditions the majority of inoculated animals failed to develop symptoms of the disease.

"Peg-Leg" Disease of Cattle.

Experiments have yielded further evidence that cattle on the "peg-leg" areas benefit markedly from the addition of phosphatic supplements to their rations.

Dipping against Cattle Tick.

Preliminary experiments showed that spontaneous oxidation of arsenical dipping fluids could be corrected by adding 0·04% of lactose.

Caseous Lymphadenitis.

It has been observed that the Preisz-Nocard bacillus may be recovered from soil that has been kept free from sheep and other animals for three years. During this period abnormally dry weather prevailed and while the soil remained dry the micro-organism could not be detected. When normal moisture and temperature were restored the micro-organisms again appeared in sufficient numbers to be detected by the methods used.

Bovine Haematuria.

Animals on pasture top-dressed with gypsum remained free from the disease while those on untreated pasture have shown signs of the disease. A low urinary inorganic sulphur content has been a constant finding in animals grazed on farms on which the disease is more or less frequent in occurrence.

Enterotoxaemia.

Results of a field trial were :– 2% deaths in 1,800 vaccinated lambs and 11% deaths in unvaccinated controls.

Genetic Investigations.

A zootechnical study of fertility and prolificacy in a long established flock of Australian merino sheep has been completed. It is shown that infective, environmental and hereditary factors affect the levels of fertility and prolificacy, and that all these factors must be controlled for optimum results. It is shown that the degree of fertility is a heritable character probably dependent upon small numbers of Mendelian factor pairs. It does not establish that twinning is wholly heritable; but multiple births are shown to be influenced by the female's age and to a very large extent by the environment, particularly the plane of nutrition prior to and at the time of mating.

A differential time of fertilizing power for the spermatozoa of Dorset Horn and merino rams has been established and associated with duration of oestrum in ewes of these two breeds. The assumed polyoestral character of merino ewes and the periodic vaginal changes reported to be typical of phases of the ovarian cycle are being investigated.

Animal Nutrition.

(a). Phosphorus metabolism of sheep. Rarely, if ever, in the thousands of blood phosphorus determinations made, have levels been observed which could imply any serious degree of phosphorus deficiency in sheep on natural pastures.

(b). Influence of high concentration of calcium and magnesium on the assimilation of phosphate by growing sheep. Administration to sheep, on an adequate ration, of 30 g. of calcium and 10 g. of magnesium as carbonates brought about no change other than a slight reduction in blood phosphate. The sheep receiving the above high amount of uncompensated alkaline earth elements did extraordinarily well during the two and a half year period of observation. At the end of this period they were significantly better grown than the controls and averaged 10 kg. heavier. Bones were decidedly heavier, better calcified and more dense than bones usually met with in sheep raised under what are considered ideal nutritive environments. It was found that relatively large quantities of alkaline earth elements in the diet brought about no change in the reaction of the bowel contents. Calcium was absorbed in the small intestine and excreted in the caecum. It is stated that relatively large amounts of vitamin D would be necessary to overcome the effects of a similar high quantity of calcium in the diet of non-ruminant animals. It is suggested that these results indicate that sheep under natural grazing conditions in Australia could assimilate P equally as well from the relatively inexpensive ground rock phosphate as from costly dicalcic phosphate.

(c). Comparison of mono-, di- and tricalcic phosphate as sources of phosphorus supply for sheep. After 18 months there was no difference between the growth of the sheep in groups on a phosphorus-deficient diet supplemented with an extra 1 g. of phosphorus per day in the form of tricalcic phosphate (as bone meal or as Christmas Island rock phosphate) and those receiving the same quantity of phosphorus in the form of dicalcic phosphate. Sheep in the group receiving a like amount of phosphorus as monocalcic phosphate in the form of commercial superphosphate have not done so well, presumably on account of the continual ingestion of 170 mg. of fluorine each day, which occurs as an impurity in the commercial superphosphate used. The effects arising from the constant assimilation of the much smaller amounts of fluorine in Christmas Island rock phosphate (60 mg. fluorine per day) make themselves apparent in the condition of the enamel of the more recently erupted incisors, these being pitted and eroded. There was

no evidence of impairment of growth. Control sheep receiving only 0·6 g. phosphorus daily in the basal ration have done practically as well as sheep receiving an additional 1 g. of phosphorus in supplements. There is, however, a striking difference in blood phosphorus, the average in the controls being 3·6 mg. per 100 c.c. and that in the groups receiving extra phosphorus ranging from 6·5 to 7·5 mg. per 100 c.c.

(d). Coast Disease. Young sheep fed in pens on hay from coast disease areas developed a severe form of the disease. Anaemia was severe, haemoglobin often falling to less than 30% of the normal. Administration of 1 mg. cobalt daily to sheep showing extreme symptoms brought about very rapid recovery. The iron content of livers of affected sheep was found to be greatly increased while the copper content was greatly reduced. The anaemia is of a microcytic, hypochromic type. In a field experiment with this disease dosing with 10 g. of finely powdered limonite three times weekly failed to prevent the disease developing. Pure iron salts also failed. Dosing with cobalt and iron plus cobalt was effective in preventing the onset of the disease.

Sheep Blowfly Pest.

Maggots have been identified from over 1,000 cases of strike in different parts of Australia. *Lucilia cuprina* was present in 80% of strikes. Of the remaining 20% *Calliphora augur* (including *C. nociva*) was the most frequent fly, with *C. stygia* (including *C. australis*) next in importance, while *Lucilia sericata* was rare as a primary sheep-striking fly. *L. cuprina* is well adapted to live in arid country and it has been shown that increasing the desiccation of carrion retards growth of maggots, but does not affect survival.

Studies of substances which attract or repel blowflies have been continued, particularly in regard to the fractionating of the egg yolk sulphide bait which has been reduced to a relatively simple attractive residue after distillation of the attractive filtrate obtained from a lecithin-sulphide preparation; and in regard to the discovery that certain volatile compounds, such as acetic acid, restore the attractiveness of old baits. When they are exposed in such a manner they do not mix with the bait, but their odours are mingled with its emanations. The usual tests of supposed repellents are not considered to have been reliable in the past, and a simple method has been developed for mixing the odour from a substance to be tested with that from an attractive bait without affecting the composition of the bait. Many substances have been tested by this method and the only true repellents found were the halogens, iodine and chlorine.

An attempt was made to determine the relative importance of the different parts of the breech in regard to strike. The conformation of the breech influences predisposition to breech strike and the different sections of the breech have now been defined and the strikes on these sections recorded. Nearly 90% of all breech strikes involved the inner breech folds, about 50% being restricted to these folds; 6% started on the tail and the remainder were divided between the perineum, true crutch and outer breech area.

The clinical course and pathology of fly strike has been studied. It was found that maggots can produce perceptible injury to the skin in four to six hours after hatching and that by the third day the skin and subjacent tissues are extensively inflamed, the epithelium is denuded over extensive areas, the wool follicles and glands are disorganized, the body temperature has risen to 104-105°F. and the animal is obviously sick. Temperature rises further on the fourth day and at this stage a break may develop in the general body fleece. Maggots begin to leave on the fifth day, after which the temperature gradually falls to normal and healing

takes place by simple resolution without scarring and without effect on the subsequent growth of new fleece. The chief complications are :– (1) extension (by development of additional maggots from eggs deposited on the highly attractive struck area) ; (2) break in the fleece (which may be restricted to the struck area, when it is due to inflammatory disorganization of the wool follicles and occasionally to bacterial decomposition of the fibres, or wide-spread, when it is an expression of the general constitutional disturbance), (3) sepsis in the strike wounds, and (4) death (due to exhaustion and toxic absorption, or possibly to invasion by highly virulent bacteria).

Artificial and experimental strikes have been produced under a considerable variety of conditions and results show that :– (1) the one condition essential for all forms of strike is that the fleece should be palpably wet right through to the skin and remain wet for periods varying from a few hours for artificial strikes up to several days for natural or experimental field strikes ; (2) inflammatory changes in the skin and bacterial activity in the fleece are important accessory conditions influencing the occurrence of strike, especially under field conditions ; (3) that the various conditions which are known to predispose a sheep to be struck act :– (a) by favouring the deposition and retention of moisture in the fleece ; (b) by rendering the area more quickly attractive to the flies and the skin more easily invaded by the maggots, thereby decreasing the time for which the area must remain wet, or (3) by supplying the newly hatched maggots with readily assimilable food.

Borax, diluted with one or two parts of inert dust, has been found superior to sodium fluoride for treatment of carcasses to poison maggots.

Field experiments have shown that intensive trapping decidedly reduces the incidence of strike in sheep. Further experiments are necessary to determine whether intensive trapping is an economic practice. Work on the chemical treatment of baits suggests that calcium sulphide may be superior to sodium sulphide. Surgical removal of breech wrinkles (Mules operation) was followed by a decided reduction in strike incidence. Glycerin-boric acid dressings have proved satisfactory and it was found that dilution with 25% ethyl alcohol improved the consistency, shortened the time required to rid the strike of maggots, and slightly cheapened the dressing. Commercial methylated spirit was not satisfactory as a diluent, but alcohol denatured with up to 5% of methanol was suitable. A mixture of soap with crude glycerin was not satisfactory for preparation of the dressing.

BUFFALO FLY (*Lyperosia exigua*).

The parasites *Spalangia orientalis* and *S. sundaica* liberated four years ago have not produced any detectable effect on the abundance of buffalo flies, or on the damage they cause.—H. McL. GORDON.

NORTHERN IRELAND. (1937). **Report of Veterinary Research Division 1931-1934.**—*11th Annu. gen. Rep. Minist. Agric. N. Ire. 1931-1934.* pp. 59-62. 2 tables. [4 refs.]

Reference is made to the Spahlinger experiment [*V. B.* **7.** 208].

POULTRY DISEASES.—During 1931-34, 7,986 specimens were examined. In the same period 373,439 blood samples were tested for BACILLARY WHITE DIARRHOEA, and during 1933-34 over 25,000 doses of fowl pox vaccine were supplied. Two outbreaks of FOWL CHOLERA occurred in 1933 and one in 1934.

PIG DISEASES.—29 P.M. examinations were conducted in 1932-33 and 138 in 1933-34. SWINE ANAEMIA, SWINE ERYSIPELAS, WORMS and NECROTIC ENTERITIS were the principal conditions dealt with.

SHEEP DISEASES.—Serious losses occurred during 1932-34 and enquiry indicated that PARASITIC GASTRITIS was responsible – *Haemonchus contortus* was the chief parasite involved. Treatment with 1% solution of copper sulphate has given good results. 188 wool scrapings were examined for SHEEP SCAB and 156 gave positive results.

CONTAGIOUS DISEASES.—During 1931-34, 42 suspected cases were investigated in the laboratory.

TUBERCULOSIS.—During 1932-34, 826 milk samples were examined under the provisions of the Bovine Tuberculosis Order; 82 were positive on microscopic examination.—J. C. WALLACE.

INDIA. (1937). **Annual Report of the Imperial Institute of Veterinary Research, Muktesar, For the Year ending 31st March 1936.** [WARE, F.] pp. iii + 53. 2 tables, 6 appendixes. New Delhi: Govt. India Press. [8vo] [Rs.1.12]. [3s.]

The report of the Director deals with staff, supplies and services, production, instruction, research, publications and finance.

REPORT OF THE SEROLOGY SECTION. [HADDOW, J. R.]—Research has been started to determine the duration of immunity following goat-virus inoculations against rinderpest. Other work included experiments to improve BLACKQUARTER vaccine, examination of material for BOVINE CONTAGIOUS ABORTION, BOVINE MASTITIS, EQUINE CONTAGIOUS ABORTION, experiments on the artificial infection of young stock with STRANGLES with a view to controlling the disease, and investigations in connexion with PNEUMONIA in fowls, EQUINE ENCEPHALOMYELITIS, RANIKHET DISEASE [Newcastle disease] in fowls, FOWL POX and FOOT AND MOUTH DISEASE. Observations were made on AMAUROSIS in calves, OSTEOMALACIA in cattle, "KUMRI" in horses, mineral feeding experiments, estimation of the vitamin A content in the livers of animals in health and disease, and deficiency diseases of fowls.

REPORT OF THE PATHOLOGY SECTION [DATTA, S. C. A.]—Investigations into the suggestion that the bacillus of JOHNE'S DISEASE may be excreted in the milk of affected cows and that intra-uterine transmission occurs, have given negative results. There was failure to isolate significant micro-organisms from two natural cases of CIRCLING DISEASE IN SHEEP mentioned in the report of the previous year. Investigation commenced in connexion with HORN CANCER of cattle; the suggestion that a helminth parasite may be involved was not proved by microscopic studies carried out. Further work on NEOPLASMS is being arranged. Other conditions studied were TUBERCULOSIS, LYMPHANGITIS in horses, calf diseases, ENZOOTIC BOVINE HAEMATURIA, lesions consequent upon electrocution, osteodystrophic diseases, "KUMRI", canine disorders and LEUCODERMA in a horse.

REPORT OF PROTOZOOLOGY SECTION [WARE F.]—It has been found that treatment with trypan blue does not eliminate the infection from the body in REDWATER in cattle. The results of work carried out on the treatment of THEILERIASIS in cattle with antiserum has led to the commencement of large-scale experiments to confirm preliminary observations.

ENTOMOLOGY.—Tests of the transmission of rinderpest through the agency of *Stomoxys calcitrans* yielded negative results. The study of the life-history of insects and arachnids of veterinary importance was continued. The occurrence of *Ornithodorus megnini*, the spinose ear tick of America, is reported for the first time in India. Other subjects dealt with included the identification of specimens, anatomical studies, MANGE, WARBLES and MYIASIS.—J. C. WALLACE.

HUNGARY. (1936). A m. kir. Országos Állategészségügyi Intézet muködése az 1935. évben. **[The Work of the National Veterinary Institute for 1935].** [MANNINGER, R.]—*Állatorv. Lapok.* **59.** 303-308. 3 tables.

Details are given of the diagnostic work carried out. Some 90,000 objects were examined, including 1,064 brains for the diagnosis of rabies. 43% of the latter were positive. In ruminants and pigs the presence of Negri bodies is not as reliable for the diagnosis of rabies as in dogs; these bodies can only be found in about 25-50% of cases. Figures for the production of vaccines and antisera are given.—Z. DE CSUKÁS (MAGYARÓVÁR).

Extracts from Annual Reports of Agricultural Experiment Stations U.S.A. [When papers on the subjects dealt with appear in various publications abstracts are prepared from them and included in the *Veterinary Bulletin* as a matter of routine].

ARKANSAS, 1935-1936. (1) tetrachlorethylene (1 c.c.) plus arecoline hydrobromide (gr. 1/20) found to be 100% effective as a vermifuge for fowls. (2) life histories of Arkansas horseflies (*Tabanus spp.*) were studied.

CALIFORNIA, 1934-1936. Work was done on the following :– (1) the problem of no-visible lesion reactors to the tuberculin test. (2) BCG was found to be of no value for immunizing calves against tuberculosis (research period 10 years). (3) bovine brucellosis agglutination tests, calfhood vaccination and porcine brucellosis. (4) bovine anaplasmosis. (5) vesicular exanthema of swine. (6) sheep diseases and parasites. (7) fowl pox, fowl coryza and pullorum disease.

COLORADO, 1935-1936. (1) control of bovine brucellosis. (2) equine encephalomyelitis. (3) sheep diseases. (4) poisoning by timber milk vetch and by oat-hay.

CORNELL, 1936. (1) stiff lamb disease. (2) cod liver oil and muscle dystrophy in calves. (3) hormonal treatment of sterility in cows. (4) causes of still birth in pigs. (5) diet and sexual physiology. (6) effect of fluorine on bones and teeth.

FLORIDA, 1935-1936. (1) haemorrhagic septicaemia in cattle and swine. (2) pullorum disease. (3) fowl paralysis and leucaemia. (4) poisonous plants.

MICHIGAN, 1935-1936. (1) control of bovine brucellosis and related research schemes. (2) calf pneumonia. (3) streptococcal mastitis. (4) rickets in calves. (5) sheep diseases. (6) methylene blue reduction test of milk. (7) control of tapeworms. (8) diagnosis of helminthic infestation. (9) coccidiosis and amoebiasis.

MINNESOTA, 1935-1936. (1) 11 research projects on bovine brucellosis are listed. (2) avian lymphadenosis. (3) diagnosis of swine fever. A list of veterinary papers published during the year is given.

NEBRASKA, 1936. (1) swine erysipelas. (2) aggressin against haemorrhagic septicaemia. (3) immunization against swine fever. (4) poultry diseases.

OHIO, 1935-1936. (1) rapid whole-blood test for pullorum disease. (2) immunity in fowl coccidiosis. (3) crystal violet vaccine against swine fever. (4) mad itch (Aujeszky's disease) in cattle. (5) helminthiasis in lambs. (6) fowl paralysis. (7) rickets in calves. (8) nervous tissue lesions in vitamin A deficiency. (9) nutritional value of pasteurized milk. (10) pH of the rumen contents. (11) iodine content of the bovine thyroid. (12) hormonal treatment of bovine sterility. (13) sexual physiology in goats.

SOUTH DAKOTA, 1935-1936. (1) breeding of sorghum strains for low HCN content. (2) alkali disease (selenium poisoning). (3) vitamin D and calcium in milking cows and milk. (4) tests of oil of chenopodium extracted from new strains of the plant.

TENNESSEE, 1936. (1) control of bovine brucellosis. (2) poultry yard sanitation.

UTAH, 1934-1936. (1) bovine brucellosis. (2) mosquito transmission of equine encephalomyelitis. (3) fowl paralysis and iritis.

WEST VIRGINIA, 1935-1936. (1) vitamin A sufficiency or deficiency found not to influence susceptibility of swine to *Ascaris*. (2) copper sulphate and oil of pyrethrum tested against worms of sheep.

WISCONSIN, 1935-1936. (1) streptococcal mastitis. (2) bovine brucellosis. (3) sulphur as preventative of coccidiosis in chicks. (4) value of blood counts in cattle diseases. (5) sexual physiology in cattle. (6) the importance of copper for blood formation. (7) rickets. (8) aluminium salts as antidote for fluorine poisoning. (9) slipped tendons in fowls. (10) gizzard lesions in young fowls.

WYOMING, 1935-1936. (1) blackhead in turkeys. (2) stiff lambs. (3) roup. (4) bovine brucellosis control. (5) tapeworms of sheep and rabbits. (6) selenium poisoning. (7) plant poisoning.—J. E.

UNITED STATES OF AMERICA. NEVADA. (1936). **Report of Division of Animal Industry, Department of Agriculture, 1934-1936.** [EARL, W. B.]—*Bienn. Rep. Nev. Dep. Agric. 1934-1936.* pp. 10-22. 2 tables.

The veterinary staff included two whole-time and three part-time veterinarians.

ANIMAL DISEASES.—The situation was good, there being nothing of interest to report in connexion with ANTHRAX, BLACKLEG, SWINE FEVER, RABIES or MANGE. MASTITIS was detected in 21 out of 29 herds, but only 64 out of 966 cows were affected. Nevada continued to be a "modified accredited area" in the tuberculosis eradication scheme, the percentage of reactors in 1936 being 0·13. Preliminary large scale tests for BOVINE BRUCELLOSIS were begun in 1934 and so far the results show that the disease has a very low incidence in the state. BACILLARY HAEMOGLOBINURIA occurs in Nevada but did not cause much loss: a vaccine and an antiserum are available for controlling it. Dourine exists in Nevada, but no state control has yet been applied and California will not admit any horses from Nevada. EQUINE ENCEPHALOMYELITIS occurs in small outbreaks; it is being investigated with the object of producing a reliable vaccine.—J. E.

I. INDOCHINA, ANNAM. (1936). Rapport annuel 1935 des services vétérinaires de l'Annam. [**Report of the Veterinary Service for Annam, Indochina for 1935**].—*Bull. écon. Indochine.* **39.** 39-44. 1 table.

II. INDOCHINA, TONKIN. (1936). Rapport annuel 1935 du service vétérinaire, zootechnique et des épizooties du Tonkin. [**Report of the Veterinary Service for Tonkin, Indochina for 1935**].—*Ibid.* 31-38. 1 table.

I. STAFF.—There were 7 European veterinary inspectors and 11 indigenous veterinary assistants.

Nothing is said about ANIMAL DISEASES. Notes are given on abattoirs and on the swine export (quarantine) order, by which pigs must be held for 72 hours at the port.

II. STAFF.—There were ten European veterinary inspectors and 29 indigenous veterinary assistants, apart from others on lower grades.

ANIMAL DISEASES.—A few cases of TUBERCULOSIS were found in slaughtered cattle. TB. is not wide-spread, being known on nine estates of Europeans and in three dairy farms. GLANDERS and ANTHRAX have been observed to a small extent. SURRA has been seen in three Provinces. RINDERPEST occurred in four Provinces and vaccination was employed on 21,386 ruminants. FOOT AND MOUTH DISEASE broke out near Hanoi, but, being benign, gave little trouble. SWINE FEVER has

only been observed in one locality. RABIES was diagnosed in 50 dogs, in-contact animals being killed. There is a dog vaccination service for owners who can defray the cost. FOWL PLAGUE, FOWL CHOLERA and FOWL TYPHOID occurred in Tonkin.

LABORATORY WORK.—There is a laboratory at Bach-Maï where diagnostic work and vaccine preparation work are carried out.—J. E.

BOOK REVIEWS.

ANDERSON, C. G. [Ph.D. (Birm.), D. Bact. (London), Lewis Cameron Teaching Fellow, Bacteriology Dept. University of Edinburgh]. (1938). **An Introduction to Bacteriological Chemistry.** pp. viii + 278. 6 figs., 19 tables, 1 appendix. [Numerous refs.] Edinburgh: E. & S. Livingstone. [8vo] [10s. 6d.]

The biochemical side of bacteriology has developed tremendously within recent years though much of the knowledge is as yet fragmentary and incomplete. This little text-book intended primarily " to cover the requirements of students and perhaps of those research workers . . . who feel the need for some understanding of the metabolic behaviour and chemical nature of the organisms which they are handling " is presented as a general survey of the field of bacteriological chemistry. This survey is not intended to be in any way complete: indeed, knowledge of the mechanisms involved in disinfection and chemotherapy, and of culture media and staining reactions, is still largely empirical and no attempt has been made to deal with them in this book. Furthermore, in his efforts to keep this survey within reasonable limits, A. has had to assume a knowledge of the fundamentals of bacteriology and of organic chemistry on the part of the reader.

The subject matter is divided into three sections. The first deals with physico-chemical conceptions of pH, oxidation-reduction potentials, colloids and absorption phenomena, the general principles of enzyme activity and the consideration of the broad chemical composition of bacteria, yeasts and the lower fungi; the third section is mainly concerned with certain aspects of immuno-chemistry including the mechanism of antigen-antibody reactions. The greater part of the book, however, is devoted to considerations of the metabolism of bacteria and fungi. There are chapters on proteins, polysaccharides, lipoids and pigments of micro-organisms, and the carbohydrate and nitrogen metabolism of these forms is dealt with in some detail. The subject of alcoholic fermentation is especially well treated, while a further chapter is concerned with the commercial importance of micro-organisms and of their roles in industrial fermentations.

A welcome feature of the book and one which should be more extensively applied to text-books, is the small but very selective list of references to larger works and original papers, appearing at the end of each chapter. In a small appendix methods are given for the detection and isolation of metabolic products of bacteria.

The printing is good and the general arrangement of formulae, figures and tables is very clear.

As an introduction to bacteriological chemistry and as a survey of this particular field, this book can be warmly recommended and should prove of immense value and interest to biochemists and bacteriologists generally.—ALFRED EDEN.